iREAD GHANA STUDY

FINAL EVALUATION REPORT

Final Version: January 26, 2012

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Acronyms

BECE	Basic Education Certificate Examination
(E)	E-Reader Group
(E+OCE)	E-Reader plus Out-of-Classroom Exploration Group
GES	Ghana Education Service
GDA	Global Development Alliance
ILC Africa	Ivy League Consult Africa
iREAD	Impact on Reading of E-Readers and Digital Content
JHS	Junior High School
M&E	Monitoring & Evaluation
(NE)	No E-Reader Group
OCE	Out-of-Classroom Exploration
P	Primary
SHS	Senior High School
SO	Strategic Objective
SEA	School Education Assessment
WASSCE	West African Senior School Certificate Examination
USAID	United States Agency for International Development

Executive Summary

Introduction

The iREAD (Impact on Reading of E-Readers and Digital Content) Ghana Study was a pilot study spanning from October 2010 to July 2011. It was categorized as a Global Development Alliance (GDA) project between the United States Agency for International Development (USAID) and Worldreader, a non-profit organization.

The pilot study aimed to give Ghana public school students access to books through e-reader technology, which is an electronic device that can house thousands of books. The iREAD project aligns with USAID's Strategic Objective 8 (SO8) to "Improve the Quality of and Access to Basic Education." iREAD supported SO8 Intermediate Result 2 to "Improved Quality of Education," through the following expected results:

- Increased access to a number and variety of books and other supplementary reading materials read by the participants of the study
- Improved student performance on standardized tests of reading, writing, and English proficiency among study participants
- Reduced waiting periods in classrooms for classroom material
- Reduced net cost of production, translation, and distribution of supplemental reading material

ILC Africa, an Africa-based private local organization, served as the Monitoring and Evaluation (M&E) advisory team within the larger iREAD Ghana Study. Throughout the duration of the project, the ILC Africa M&E team collected monitoring data to provide USAID with monthly reports. ILC Africa was also contracted to carry out the baseline, mid-term, final and administrative close-out reports.

This final report serves as the official, summative assessment of the e-reader within the pilot study, factoring both anticipated and unanticipated results.

Methodology

The iREAD team established the following three experimental groups:

1) No E-reader Group (NE): no access to e-reader devices
2) E-Reader Group (E): access to e-reader devices
3) E-Reader plus Out-of-Classroom Exploration Group (E+OCE): access to e-reader devices with mentoring and extracurricular support

With the assistance of the Ghana Education Service (GES), Worldreader selected a purposive sample of 481 students in 9 project-affected schools from the communities of Suhum District, Kade, and Adeiso. This sample size was determined using a confidence level of 95% and a confidence interval or margin of error of +/-4 for an estimated population of 10,700,000 Ghanaian children below 18 years of age.[1]

Hypotheses

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[1] http://www.unicef.org/infobycountry/ghana_statistics.html

There were several major hypotheses about the outcomes of the pilot study. It was proposed that by the end of the study, the (NE) group would have the least access to reading materials, the least interest in reading, and the least improvement in standardized reading scores as compared to the (E) and the (E+OCE) groups. Also, it was proposed that the (E+OCE) groups would surpass the (E) groups in these measures due to the assumed benefits of mentoring and out-of-classroom exploration (OCE) activities. Finally, it was proposed that in the long run, the e-reader would serve as a more efficient and economical delivery mechanism for books than the traditional paper book system.

Findings

Overall, the majority of students and teachers from the iREAD Ghana Study had positive experiences with the e-reader. Feedback from the mid-term and final evaluation supports the general sense that the e-reader has a role in the future of the Ghanaian public school curriculum.

The ILC Africa team identified several effects related to the use of the e-reader, both positive and negative.

Positive effects included:

- Increased access to books
- Increased enthusiasm towards reading
- Increased resources for teachers
- Increased technological skills
- Increased performance on standardized scores at the primary level, especially among primary students receiving OCE interventions

Data from the pilot study reveal that there are short-term, medium-term, and long-term benefits to incorporating e-readers into the Ghanaian public school system.

There were also many challenges to the management of e-readers within the pilot study. These experiences can serve as lessons learned for future project implementation. The study identified breakage as the greatest project concern, as almost half of e-readers experienced some breakage. In terms of the study's limitations, major limitations were that the sample of students was not geographically representative of Ghana and that time exposure to the tool was greatly reduced due to challenges like delayed project start dates, device breakages, and teacher strikes.

Unanticipated results of the e-reader were both positive and negative, as follows:

Positive:
+Students shared the benefits of the e-reader with family and friends
+Students and teachers learned to navigate e-reader technology very quickly
+E-reader loss and theft were dramatically lower than anticipated
+E-readers increased exposure of Ghanaian authors

Negative:
-E-reader breakages were much higher than anticipated
-Certain e-reader functions caused frustration, such as accidental book deletion and improper use of music and internet during class time.

Negative unanticipated results are currently being addressed by Worldreader in close collaboration with Amazon, the leading e-reader manufacturer.

At this time, the primary factor limiting the e-reader's sustainability is the high device breakage rate. However, should technical improvements to the device reduce the breakage rate to minimal levels, and should the cost of the device continue to fall, the e-reader would be an efficient, cost-effective method to distribute textbooks and educational material.

Conclusions

Data from the pilot study reveal that there are short-term, medium-term, and long-term benefits to incorporating e-readers into the Ghanaian public school system.

Primary among the short-term benefits is that students have immediate and reliable access to books for academic and personal use, without having to depend on the traditional paper book system that is currently used. In the medium-term, students and teachers have access to reading materials and teaching resources that facilitate and significantly accelerate the learning process since students are able to have direct access to information in a home setting. This gives students and teachers the opportunity to extend learning beyond the allotted class time. Unlike the traditional school environment where students are not allowed to take books home, the e-reader provides the opportunity for extended reading and homework assignments beyond the classroom In the long-term, final evaluation data strongly suggest that when the device is introduced and managed properly among primary level students, it has the potential to improve reading performance, and more importantly increase enthusiasm for reading as a lifetime habit. Therefore, the e-reader has impact along a continuum of short- to long-term effects.

Recommendations

In the spirit of creating recommendations that are directly relevant, manageable, and doable, the evaluation team proposes 13 specific recommendations across three categories:

1. Methodological/Study Design Recommendations
2. Programmatic Recommendations
3. Technological Recommendations

Methodological/Study Design Recommendations focus on the strengths and weaknesses of the methodology and the design of the pilot study overall. Programmatic recommendations center on ways that the program could be more effective and ways that teachers and program implementers could carry out activities differently. Lastly, the technological recommendations focus more on hardware issues related to the device.

The table below summarizes recommendations as well as the stakeholders each recommendation specifically addresses. Stakeholders include Worldreader, the future evaluation team, donor partners, government agencies, product manufacturers, microfinance organizations and potential device distributors, publishers, teachers, students, and administrators.

Recommendations and Affected Stakeholders

No.	Recommendation	Worldreader	Future Evaluation Team	Donor Partners (ex: USAID)	Government Agencies (ex: MoE/ GES)	Manufacturers (ex: Amazon)	Microfinance Organizations & Potential Device Distributors	Publishers	Teachers/ Administrators/ Students
	Methodological/Study Design Recommendations								
1	Use a genuine random sample for the purposes of drawing conclusions on Ghanaian public schools	✓	✓						
2	Limit influences and exposure within the control group	✓	✓						
3	Modify data collection tools to capture data on student reading habits	✓	✓			✓			
	Programmatic Recommendations								
4	Focus on primary schools and OCE activities to maximize benefits	✓		✓	✓				
5	Pilot potential funding mechanisms to explore sustainability	✓		✓			✓		
6	Gain greater stakeholder buy-in	✓							
7	Integrate e-readers more fully into the entire curriculum	✓			✓			✓	✓
8	Reduce logistical challenges for iREAD 2011-2012	✓							
9	Continue to build the capacity of teachers so that the tool is used to its maximum potential	✓			✓				✓
10	Introduce e-readers to teacher training colleges and teachers' unions	✓			✓				
11	Expand iREAD Activities to underserved areas	✓		✓	✓				
	Technological Recommendations								
12	Reduce the number of e-reader breakages	✓				✓			
13	Develop an improved e-reader management system	✓				✓			

Although Worldreader has started to address many of recommendations, the Worldreader team would greatly strengthen its future programs by fully achieving the recommendations.

1. BACKGROUND OF THE iREAD PROJECT

1.1 INTRODUCTION

Recognizing that private sources invest more capital in developing countries than public sources, USAID is committed to exploring non-traditional assistance models that leverage innovative partnerships to stimulate new, sustainable development practices. The (iREAD) Ghana Study was a pilot study spanning from October 2010 to July 2011. It was categorized as a Global Development Alliance (GDA) project between the United States Agency for International Development (USAID) and Worldreader, a non-profit organization. The GDA program is a USAID initiative that promotes strategic private-public partnerships that benefit both private sector interests and USAID's development objectives.

The pilot study aimed to give Ghana public school students access to books through e-reader technology, which is an electronic device that can house thousands of books. The iREAD program aligns with USAID's Strategic Objective 8 (SO8) to "Improve the Quality of and Access to Basic Education." iREAD supports SO8 Intermediate Result 2 "Improved Quality of Education," through the following expected results:

- Increased number and variety of books and other supplementary reading materials read by the participants of the study
- Improved student performance on standardized tests of reading, writing, and English proficiency among study participants
- Reduced waiting periods in classrooms for classroom material
- Reduced net cost of production, translation, and distribution of supplemental reading material

ILC Africa, an Africa-based private local organization, served as the Monitoring and Evaluation (M&E) advisory team within the larger iREAD Ghana Study. Throughout the duration of the project, the ILC Africa M&E team collected monitoring data to provide USAID with monthly reports. ILC Africa was also contracted to carry out the baseline, mid-term, final, and administrative close-out reports.

In early 2011, USAID introduced two major policies/strategies relevant to the iREAD Ghana Study. USAID issued the new Evaluation Policy in January 2011, which called for more rigorous evaluations and methodologies with an emphasis on impact evaluations. Secondly, USAID issued the new Education Strategy 2011-2015 in February 2011.

Having already started the project in October 2010, the project was not able to fully integrate some of the policies released in 2011. Of primary concern was the need for a more rigorous sampling methodology to be used in the iREAD pilot. In addition to the new evaluation policy, the new education policy calls for more focus on primary school-aged children. This new policy aligns quite well with the new target intervention groups of primary school-aged students in the iREAD study.

This final report serves as the official, summative assessment of the e-reader within the pilot study, factoring both anticipated and unanticipated outcomes.

1.2 ASSESSMENT OBJECTIVES

The main objective of the iREAD Ghana Study final evaluation was to collect data to determine whether iREAD interventions had any effect on access to reading materials, student reading performance, and the overall academic environment. More specifically, the evaluation team was guided by the following key questions:

- Did iREAD interventions affect student access to reading materials?
- Did iREAD interventions affect teacher access to educational resources?
- Did iREAD interventions affect student attitudes towards reading?
- Did iREAD interventions affect teacher and student technological capabilities?
- Did iREAD interventions have an effect on student reading performance in any meaningful way?
- What were the unanticipated effects of iREAD interventions?
- Are iREAD interventions a sustainable option compared to traditional paper books?

This report addresses each of these questions by incorporating the pilot study experiences of students, teachers, administrators, and stakeholders.

2. METHODOLOGY

The aim of the pilot iREAD Ghana study was to measure the effects of the e-reader on study participants in terms of access to books, skills gained, and reading performance within the overall Ghanaian academic experience. The study also aimed to identify areas in which the existing e-reader device could be modified in order to be more effective in developing-country classrooms. The study allowed for a 'sandbox' environment in which stakeholders could learn about the unanticipated results of the device in a real Ghanaian public school setting.

The methodology section outlines the research design of the pilot study as well as methods used for the three interim evaluations (baseline, midterm, and final).

2.1 iREAD PILOT STUDY RESEARCH DESIGN

Before implementing the project, the Worldreader Team developed a research design to isolate the effect of the e-reader on experimental student groups.

The iREAD team established the following three experimental groups:

4) No E-reader Group (NE): no access to e-reader devices
5) E-Reader Group (E): access to e-reader devices
6) E-Reader plus Out-of-Classroom Exploration Group (E+OCE): access to e-reader devices with mentoring and extracurricular support

With the assistance of the national-level representatives of the Ghana Education Service, Worldreader selected a purposive sample of 481 students in 9 project-affected schools from the communities of Suhum District, Kade, and Adeiso. The sample size was determined using a confidence level of 95% and a confidence interval or margin of error of +/-4 for an estimated population of 10,700,000 Ghanaian children below 18 years of age.[2]

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[2] http://www.unicef.org/infobycountry/ghana_statistics.html

Table 1.0 below summarizes the experimental (NE), (E), and (E+OCE) groups within the pre-selected communities. The (NE) group located in the town of Suhum, Ghana consisted of three control groups across primary, junior high school (JHS), and senior high school (SHS) levels. The (E) group located in the town of Kade, Ghana also consisted of three groups across primary, JHS, and SHS grade levels. Thirdly, the (E+OCE) group located in the town of Adeiso, Ghana consisted of three schools across primary, JHS, and SHS grade levels. The three communities are a distance of 30-60 minutes driving from each other.

Table 1.0 – Summary of iREAD Research Design

	No E-Reader (NE) Group in Suhum District, Ghana	E-Reader (E) Group in Kade, Ghana	E-Reader plus Out-of-Classroom Exploration (E+OCE) Group in Adeiso, Ghana
Primary Form 4	Teacher Mante Presbyterian Primary 47 students	Presbyterian Primary in Kade 42 students	Presbyterian Primary in Adeiso 45 students
Junior High School (JHS) Form 1	Teacher Mante D/A JHS 39 students	Presbyterian JHS in Kade 45 students	Presbyterian JHS in Adeiso 75 students
Senior High School (SHS) Form 1	Presbyterian SHS in Suhum 58 students	Kade Secondary Technical School 70 students	Presbyterian SHS in Adeiso 60 students
Total Students: 481[3]			

When selecting these sites, the Worldreader team and the Ghana Education Service (GES) were guided by specific criteria for the pilot study, namely the need for:

- Public schools located within three hours driving from Accra, given travel costs
- Public schools that are representative of non-urban school environments
- Approximate 1:1 ratios of male to female students
- Access to electricity and mobile networks to facilitate e-reader use (charging devices and downloading material)

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[3] The number of students listed in Table 1.0 represents the number of study participants in July 2011. However, it is important to note that the number of students has varied over the course of the study, as the number of students in each class changed on a monthly basis due to high rates of student turnover. High turnover rates may be attributed to the agricultural and socio-economic backgrounds of the majority of students, who have an additional responsibility to support family life. As a result, not all students contributed to the study at the baseline, mid-term, and final evaluation points of the project. Some analysis in this report therefore focuses only on the 309 students who participated in all three interim evaluations.

Additionally, there are other factors that cause the varying number of study participants. Due to school administration's delayed decision to split (E+OCE) SHS students into streams, the number of (E+OCE) SHS students was 105 at the beginning of the study and 60 after the streams were split in Feb 2011. Furthermore, (NE) primary and JHS numbers in Table 1.0 represent the number of project-affected students at Teacher Mante Presbyterian Primary and Teacher Mante D/A JHS, but these students joined the study on 21 Feb 2011. (NE) weekly log data at the primary and JHS levels from before 21 Feb 2011 comes from formerly project-affected students at Okorasi D/A Experimental Primary School and D/A Experimental 'C' JHS.

- Established bases of teachers and administrators with demonstrated interested in the pilot study and the device, as well as the flexibility to incorporate the device into classroom curriculum

The specific grade levels for students in the iREAD study were Primary 4, JHS 1, and SHS 1. At the primary school level, Primary 4 was chosen because it is the first grade level at which schools teach English language reading and writing. At the middle school level, JHS 1 was chosen so that Worldreader could digitize textbooks and materials starting from the beginning of the JHS experience. By the time JHS 1 students would complete their first year and begin their second year, Worldreader would have had time to digitize second year content for students to use while still offering first year content to newly-entering first year students. This scenario also applies to that of the SHS grade level. Additionally, Worldreader selected first year JHS and SHS students because they tend to experience less stress than final year students who are preparing for BECE and WASSCE exams. This would allow first years (JHS and SHS) to devote more time and energy to learning new technology and reading content. Although Worldreader purposively selected schools, Worldreader randomly selected streams of primary 4 and JHS 1 students within those schools. At the SHS level, Worldreader purposively chose General Arts streams in order to focus on humanities students with more reading intensive courses.

The overall approach to developing the parameters of the study was well executed. Worldreader took into consideration the needs of its partners, namely GES and USAID, when developing the details of the project. Worldreader held participatory consultations with GES at the national level to determine the best context in which to develop the research design. With guidance from GES, Worldreader chose schools in districts where no other major USAID or GES-supported education programs were taking place, in order to avoid overlap of interventions. Additionally, Worldreader designed the study so that M&E activities would not consume a large amount of students' and teachers' time. GES advised that students should spend no more than two hours towards standardized testing and questionnaires during each of the study's three interim evaluations.

Despite Worldreader's careful considerations, however, the M&E team noted several weaknesses in the technical aspects of the sampling method. The sample for this study was purposive and therefore limits the scope of the findings to the particular area surveyed. The selection of pilot study sites in the communities of Suhum District, Kade, and Adeiso was not geographically representative of Ghana and other districts in its 10 regions. Given that the pilot study location was not a genuinely random sample and did not have equal geographic representation, the results will be applicable to that particular area of Ghana and cannot be generalized to a national level.

Additionally, although the M&E team found the confidence interval (margin of error) of +/-4 to be acceptable, a smaller confidence level and a larger sample size would assure stakeholders of the reliability of results. A larger sample size could ensure that results truly reflect the population. The M&E team recommends a revised sampling method that uses a larger sample size and smaller confidence interval of +/-2 based upon a current accurate population of school-bound children across Ghana's 10 regions.

Although these shortcomings do not negate the results of the study, the advised adjustments to the sampling method would render future results more reliable and representative of Ghana's public schools. Recommendations are made regarding the sampling method in the Recommendations section.

2.2 CENTRAL HYPOTHESIS

There were several major hypotheses about the outcomes of the pilot study. These were that by the end of the study:

- the (NE) group would have the least access to reading materials, the least interest in reading, and the least improvement in standardized reading scores as compared to the (E) and the (E+OCE) groups
- the (E+OCE) groups would surpass the (E) groups in these measures due to the assumed benefits of mentoring and out-of-classroom exploration (OCE) activities
- the e-reader would serve as a more efficient and economical delivery mechanism for books than the traditional paper book system

The major hypotheses relied on the following key assumptions:

- The (NE) group is not significantly influenced by the study's presence
- Each (E) and (E+OCE) student has access to his or her own e-reader for a full 11-month academic year
- (E+OCE) activities occur consistently over the 11-month academic year
- Aside from scheduled holidays, classes are in session without disruption
- Teachers regularly use e-readers in the classroom
- Interventions create demonstrable changes in reading performance after 11 months

Over the course of the study, various extraneous circumstances affected many of the key assumptions, as described in Table X below. Section 3.6 Limitations provides further details on these extraneous circumstances, as well as other factors affecting the validity of the findings.

No.	Key Assumptions	Extraneous Circumstances
1	The (NE) group is not significantly influenced by the study's presence	When assisting students with weekly logs, ILC Africa M&E team observed teachers at control schools expressing ideas such as, "Reading is good for your mind. If you read a lot and list a lot of books, who knows, you might get a scholarship and go to America." As a result, students in the control (NE) group may have read a higher number of average books read per week simply because the M&E team was monitoring how much they read.
2	Each (E) and (E+OCE) student has access to his or her own e-reader for a full 11-month academic year	Students only had access to e-readers for 7 months as opposed to a full 11 months, shortening access by 36.4%. This is due to the pilot study's start in late November/early December 2010 as opposed to September 2010. Additionally, over the course of the study, a total of 243 e-readers (40.5%) were reported as broken. The lack of access to the device while waiting for replacements limited student reading For roughly two months, (E+OCE) SHS students shared e-readers at a 2:1 ratio because the school's 105 SHS 1 students had not yet been split into two streams of about 50 students each. Finally, for a month at the (E+OCE) SHS school, students did not use e-readers outside of school to reduce bullying in dormitories and at home.
3	(E+OCE) activities occur consistently over the 11-month academic year	OCE activities for primary and JHS levels did not begin until December 2010, and OCE activities for SHS students did not begin until February 2011. As a result, OCE activities only took place over 5-7 months.
4	Aside from scheduled holidays, classes are in session without disruption	Due to nationwide teacher strikes, classes were not in session for two or more weeks during the month of March, depending on the school. Additionally, local teacher strikes cancelled classes at (E) and (E+OCE) primary and JHS schools in mid-May. For a week in March, classes at the (E+OCE) JHS school were not in session so that school buildings could be used as a local educational examination center. Also, the Worldreader Operations Manager observed that rather than attending classes, (E+OCE) JHS students were frequently seen weeding plots of

		land during school hours when he made his weekly visits.
5	Teachers regularly use e-readers in the classroom	N/A - Teacher weekly logs revealed that (E) and (E+OCE) group teachers reported actively using the e-reader for approximately 34% of class time. This establishes the integration of the e-reader into school curricula.
6	Interventions create demonstrable changes in reading performance after 11 months	Education research experts such as Robert Granger, Thomas Kane, and Harris Cooper agree that, in general, performance in reading improves gradually over time. It may be unrealistic to expect dramatic increases in reading scores after only 7 months of e-reader exposure.

2.3 iREAD PROJECT INTERIM EVALUATIONS (BASELINE, MIDTERM, AND FINAL)

The ILC Africa M&E team carried out three major evaluations (baseline, midterm, and final) throughout the 2010/2011 school year.

Baseline Evaluation

The M&E team established the context of the study by conducting a baseline evaluation. Data collection for the baseline evaluation took place in November and December 2010. In terms of the social background of study participants, only 7.8% of students spoke English at home, indicating that English was a second language for most students. The fact that students did not regularly use English outside of school may have affected reading performance on standardized test scores. Additionally, parents had low educational backgrounds, where 35% of students' fathers and 25% of students' mothers did not attend school beyond primary level. Nearly 40% of students were from agricultural backgrounds, and this may also have had an effect on the use of the e-reader device at home, as students may have been involved in agricultural activities taking time away from reading. Furthermore, the most common occupation among the mothers of study participants was a Trader, at 73%, which may have had implications on home use of the device, as mothers spent a significant amount of time outside of the home and may not have been there to supervise, advise, or supplement the use of the e-reader.

A major finding of the baseline evaluation was that students had significantly limited access to textbooks. Primary and JHS teachers reported that for many subjects, there were insufficient numbers of books. Sometimes two students had to share one book, while at other times, as many as three or four students had to share one book. Additionally, certain subjects such as Religious & Moral Education did not have any textbooks, forcing teachers to research materials on their own. No primary or JHS student in the study was permitted to take school textbooks home, preventing teachers from assigning reading homework to students.

At the SHS level, access to government books was similarly limited. For example, one high school only owned 10 copies of the government Integrated Science textbook for the entire student body. Also problematic was that government textbooks often arrived late, sometimes five months into the school year. However, SHS schools ensured access to books by requiring students to buy private textbooks as part of tuition. Due to this mandatory billing system, SHS students had access to more textbooks than primary and JHS students, and could take textbooks home.

In terms of technology, another major finding of the baseline evaluation was that 43% of study participants reported that they had never used a computer. This valuable baseline data suggests that nearly half of the study group did not have previous access to or interaction with computer-based devices.

It was additionally reported that teachers had inadequate teaching materials, as well as large class sizes and limited infrastructure.

Mid-Term Evaluation

The M&E team carried out a mid-term evaluation from March to April 2011 that measured progress at the mid-point of the study. Using pre-tested data collection instruments, the evaluation team documented some preliminary results. At the mid-term point, the greatest improvement in test scores was realized in the (E+OCE) schools, and most significantly at the primary school level. The evaluation team also found that study participants reported accessing books via the e-reader more often than before. Additionally, students were accessing a greater variety of books than before. Another interesting preliminary finding was that students read textbooks on the e-reader outside of the school homework assignments, thus increasing their frequency of reading and enhancing their overall academic experience.

The mid-term evaluation raised several important questions that were further explored in the final evaluation, namely:
- What makes OCE activities successful?
- What kinds of student backgrounds, student behaviors, and other factors are associated with the greatest benefits from the e-reader?
- Why are some of the reading standardized scores among certain students not increasing significantly by the mid-point of the project?
- What books are (NE) students accessing, and how has the presence of the study affected their reading habits?

Final Evaluation

The final evaluation provides an opportunity to compare baseline, midterm and final data and draw general conclusions, if any, about the e-reader device. Moving into the final evaluation, the assessment team modified data collection forms to capture additional data based on findings from the mid-term evaluation and stakeholder feedback. In order to gain more insight into the success of OCE activities, the team added questions to student focus groups and individual questionnaires asking students what they liked and disliked about OCE activities, and how often they attended OCE activities. The team also added questions to OCE Volunteer interviews to document OCE activities in greater detail.

In order to improve the implementation of the final evaluation methodology, the team increased use of the local Twi language when administering data collection tools to ensure better understanding. Also, during student focus groups, facilitators made greater efforts to solicit responses from less vocal students.

This report pays special attention to the unanticipated results of increased access to the device. For example, teachers were asked to provide their observations on any changes in the levels of enthusiasm among students, while case studies included both academically successful students and academically challenged students in order to gauge a wider spectrum of experiences with the device. Also, in order to gain a better understanding of the (NE) group, the assessment team added (NE) student focus groups and additional questions to (NE) teacher interviews.

2.4 FINAL EVALUATION METHODOLOGY

The iREAD final project evaluation involved 374 project-affected persons, of which 347 were students from the 9 schools of the pilot study (see Table 2.0).

Of the 347 students involved in the final evaluation, 77 were primary students, 117 were JHS students, and 153 were SHS students. The remaining 27 project-affected persons engaged in the final evaluation of the study included 20 teachers and administrators as well as 7 stakeholders and volunteers across the 9 schools.

Table 2.0 – Summary of Participants from the Final Evaluation

Level	Total
Primary 4	77
JHS 1	117
SHS 1	153
Subtotal	347
Teachers & Administrators	20
Stakeholders & Volunteers	7
TOTAL	**374**

For the final evaluation, the M&E team used a mixed-methods approach of quantitative and qualitative methods. More specifically, the team used several structured data collection methods such as:

- Key informant interviews with teachers, administrators, stakeholders, and volunteers
- Focus groups composed of teachers and students
- Reading performance assessments in the form of standardized tests
- Case studies
- Data from online e-reader accounts
- Secondary data from Worldreader and other stakeholders

Table 3.0 (below) describes the forms and processes associated with each data collection method.

Table 3.0 – Data Collection Methods

Method	Form	Description
Semi-Structured Questionnaire	Forms A, B, and G	Data entry staff coded data and entered it into a customized Microsoft Access Database called ReadME. The M&E team then used Stata, Microsoft Excel, and Microsoft Access to calculate frequencies, averages, and other statistics that are presented in this report.
Key Informant Interviews with Teachers, Administrators, Stakeholders, and Volunteers	Form E	Handwritten notes from key informant interviews were typed into the ReadME database. Audio-tapes of the interviews were transcribed and filed for future reference.
Focus Groups with Teachers and Students	Form F	Similar to key informant interviews, handwritten notes from focus groups were typed and entered into the ReadME database. Audio-tapes of the focus groups were transcribed and filed for future reference.
Assessments in the Form of Standardized Tests	Form J	Standardized tests were administered to all students as a way of measuring student progress. The M&E team marked the multiple choice, free response and essay sections of the exams. For the free response and essay sections, the team developed a grading rubric for consistent scoring. Students' total scores and sub-scores were then manually recorded onto score sheets, and the numbers from these score sheets were entered into the ReadME database. The team then used Microsoft Access to calculate frequencies, averages, and other statistics that are presented in this report.

Case Studies	Form C	Based on Worldreader and teacher recommendations, the M&E team selected students from (E) and (E+OCE) groups that represented a range of iREAD experiences. Audio-tapes were transcribed and filed for future reference.
Data from On-Line E-reader Accounts	Form I	The M&E team logged onto students' online accounts to capture information on student downloads. Additionally, Worldreader provided supplementary data on student downloads through a code that automatically retrieves information from the accounts. Data was compiled and analyzed in Microsoft Excel and Access.
Direct Observation	Form D	Handwritten notes from field observations were typed into the ReadME database.
Secondary Data from Worldreader and Other Stakeholders	N/A	The M&E team incorporated Worldreader and volunteer activity updates into the midterm evaluation. Financial information and project challenges were of particular importance to this report.

This combination of methods provided rich data for the M&E team to gain a broad understanding of student reading performance, student reading habits, and the sustainability of e-readers in the classroom.[4]

2.5 FINAL EVALUATION FIELD ACTIVITIES

The M&E team administered the majority of the data collection tools at the study sites of Suhum District, Kade, and Adeiso. Focus groups, paper-based questionnaires, and standardized tests were administered on-site, while select semi-structured interviews with stakeholders were conducted via video teleconference, email, and telephone. Table 4.0 (below) outlines how and when each data collection tool was administered during the final evaluation.

Table 4.0 – Data Collection Schedule

Data Collection Tools	Dates of Collection	Number of Participants
Student Weekly Logs	Monthly throughout project	From 481 – 546
Teacher Weekly Logs	Monthly throughout project	28
Case Studies	16, 19-21 July 2011	8
Direct Observations	Monthly throughout project	N/A
Key Informant Interviews (Teachers and Administrators)	16, 19-21 July 2011	20
Key Informant Interviews (Stakeholders & Volunteers)	26-29 July 2011	7
Focus Groups (Teachers)	16 July 2011	11
Focus Groups (Students)	19-21, 25 July 2011	69
Individual Student Questionnaires	19-21, 25 July 2011	309
Amazon Account Data	10-20 May 2011 (last 10 book downloads data); 4-5 September 2011 (complete book data)	306
Standardized Testing	19-21, 25 July 2011	309

2.6 LIMITATIONS

Overall, the M&E team identified various limitations that could affect the validity of the study. Broad themes are presented in the following order of priority:

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[4] Samples of data collection forms can be found in Appendix O.

1. Technical aspects of the methodology
   - Lack of a genuinely random sample
   - Control-group students influenced by the study's presence
   - Limitations of student logs
   - Limitations of standardized testing data
   - Change in the number of students from baseline to final
   - Differences in class sizes
   - Limitations of key informant interviews
   - Limitations of focus group data
   - Online e-reader account data

2. Reduced time with access to e-reader
   - Late access to e-reader during the 2010/2011 school year
   - Unexpectedly high e-reader breakage rates
   - Disruptions caused by teacher strikes
   - E-readers did not include reading materials for all school subjects
   - Late start of OCE activities
   - Limited OCE Volunteers from May-July
   - Limited class time at (E+OCE) JHS
   - Reduced access to e-readers outside of school for (E+OCE) SHS students
   - Delayed decision-making to split (E+OCE) SHS students into streams

3. Socio-cultural aspects
   - English language limitations
   - Potentially unsupportive home environments

Although there were limitations related to the sampling methodology, the overall design of the study was valid. The study was divided into three experimental groups that allowed for a control group. The Worldreader team also considered the potential of reading performance differences that could occur across primary, junior, and senior grade levels, thereby separating the groups into appropriate sub-categories.

The main limitation, however, was that the study was not geographically representative of all Ghanaian students across Ghana. Secondly, the control group may have been unintentionally influenced by ongoing monitoring activities such as weekly logs, standardized tests, and interviews. In an attempt to collect information for comparison against the other groups, the (NE) control group may have been heavily influenced to increase/improve their reading habits and perform well for competition's sake and the pride of the school. A third and final major technical limitation within the methodology was introduced by the use of student logs. Although an appropriate tool in theory, in practice, most students were not truthful in self-reporting information and they did not consistently complete logs. The unrealistic nature of several responses rendered the data somewhat invalid.

Several major factors led to reduced time and access to the e-reader, which may have affected the final outcome of the study. As a first and critical point, the hypotheses of the study were based on one full academic year of exposure to the device. Due to the study's late start and several major disruptions, it is estimated that students had the device for 7 months out of the anticipated 11 months. These events nearly halve any of the potential benefits of the device.

Also, an alarming 40.5% of devices broke and needed to be replaced. This phenomenon was an unanticipated result and will be discussed in more detail in the findings. Nonetheless, the lack of

access to an e-reader while awaiting a replacement further affected the 7-month access window during the academic school year.

Though the socio-cultural limitations were beyond the scope of the study's control, they are still important to note. English-language limitations and unsupportive home environments are not unique to the study participants' school environments, but rather exist throughout the country. While English is the official language of Ghana, the vast majority of Ghanaians speak one of the 11 indigenous languages sponsored by the Bureau of Ghana Languages as their native tongue (Akuapem Twi, Asante Twi, Ewe, Mfantse, Ga, Dangme, Nzema, Dagbani, Dagaare, Gonja, and Kasem). Additionally, parents having agricultural livelihoods with low levels of education may de-emphasize reading at home and may be unable to assist children with schoolwork. Nationally, 34% of adults in Ghana are illiterate (UNICEF 2008), and 23.7% of men and 35.7% of women have not completed primary school (DHS 2008). Furthermore, 41% of men and 30% of women in Ghana work in the agricultural sector (DHS 2008). Since socio-cultural limitations affecting student reading exist outside of the parameters of the study, their presence in the study likely offers a realistic picture of e-reader impact in Ghana.

A detailed description of each limitation is as follows:

Technical Aspects of the Methodology

- *Lack of a genuinely random sample:* Schools were selected using a purposive method as opposed to a genuinely random sample. Worldreader chose schools based on the broad criteria of general location, gender balance, access to electricity and mobile networks, and school interest in the project, therefore results can only be indicative of the area selected.

- *Control group students influenced by the study's presence:* Students in the control (NE) group may have reported a higher number of average books read per week simply because the M&E team was monitoring how much they read. When assisting students with weekly logs, ILC Africa staff observed teachers at control schools expressing ideas such as, "Reading is good for your mind. If you read a lot and list a lot of books, who knows, you might get a scholarship and go to America." This promotion of reading at the control schools indicates that the filling of student weekly logs itself may increase student reading, and that students in the control groups may have read more during the study than on average.

- *Limitations of student logs:* Many students may have felt pressured to record a high number of books on their logs in order to impress their teachers and the investigators, causing them to misrepresent their reading habits. Some students misunderstood the purpose and use of the data logs. Students sometimes recorded that they read during dates that were prior to the project start date or in the future, or recorded dates that did not chronologically follow each other. It is also possible that students were under the impression that they should fill every line on the form, even though the M&E team repeatedly reminded students that they should leave the space blank if they did not read on that particular day. Some students misunderstood certain questions. A high number of books read for school indicated that students might be including reading during school hours, rather than only reporting reading from outside of school.

- *Limitations of standardized testing data:* ILC Africa administered three levels of standardized examinations at the primary, JHS, and SHS levels. Standardized tests that are culturally and contextually appropriate only exist at the JHS 3 and SHS 3 levels; however, students within the study are two grades below the grade in which the test is

officially administered. Therefore, the Basic Education Certificate Examination (BECE) designed for JHS 3 students was administered to JHS 1 students. It should be expected that the reading and content level are above the average competency of a JHS 1 student. Similarly, the West African Senior School Certificate Examination (WASSCE) designed for SHS 3 students was administered to SHS 1 students. It should be expected that the reading and content level are above the average competency of a SHS 1 student. Also, there are differences between standardized tests from the baseline to final. For example, the reading comprehension section of the BECE was composed of free response questions in the baseline version of the exam but favored multiple choice questions in the mid-term version of the exam. These differences are explored more in depth in the "Are Students Reading Better?" section of the report. Additionally, *some* classrooms in which testing took place were overcrowded, enabling some students to cheat and take answers from others' papers with limited proctor supervision.

- ***Change in the number of students from baseline to final:*** The group of students throughout the study changed because students dropped out of or enrolled in the project-affected schools. Additionally, flooding and heavy rain during the final evaluation prevented a small number of students from taking the final standardized tests and questionnaires. As a result, the "n" value for trend analysis that includes only students who contributed data to all three key intervals of the study (baseline, mid-term, and final) is lower than the total number of students who participated.

- ***Differences in class size***: The pools of students in primary schools are smaller than those of the other levels, so natural variations in test scores might be expected regardless of changes in actual reading ability, to a limited extent. Differences in class sizes across grade levels at all of the schools could also affect how data represents the impact of e-readers.

- ***Limitations of key informant interview:*** Not all academic subjects are represented in the key informant interviews. Given the design of the study, the evaluation team only interviewed teachers of English, Social Studies, and Integrated Science classes.

- ***Limitations of focus group data:*** The M&E team emphasized that students should give honest and accurate answers. However, due to interview bias, students may still have been reluctant to speak freely about some of the e-reader habits that teachers disapprove of, such as downloading music, playing games, and browsing social networking sites on the e-reader. The M&E team made a special effort to call on less vocal students to ask if they agreed or disagreed with the responses that louder students put forward.

- ***Online e-reader account data:*** Although the Amazon.com website is helpful in providing download data, some information is only available for the last 10 items downloaded, and the information is sometimes incomplete. The data offers valuable insights into what material students are actually accessing, but does not give a complete picture of student reading habits.

Reduced Time with/Access to E-reader

- ***Late access to e-reader within the 2010/2011 school year***: Students had access to e-readers for 7 months as opposed to the full 11 months of the school year, shortening

access by 36.4%. This is due to the pilot study's start in late November/early December 2010 as opposed to September 2010. As a result, expected student outcomes may not have been fully achieved.

- *Unexpectedly high e-reader breakage rates***:** Over the course of the study, a total of 243 e-readers (40.5%) were reported as broken and two e-readers were lost. While student negligence contributed to breakages, Worldreader and Amazon believe that high breakage rates were primarily a result of the device's fragile screen and vulnerability to dust. In an effort to maximize students' reading capacity, Worldreader replaced broken e-readers as best as possible. However, such a high incidence of breakage limited student reading and class time. The lack of access to the device whilst waiting for the replacement may have affected the outcomes of the study. Worldreader is in the process of working with Amazon to develop and test more durable e-reader designs.

- *Disruptions caused by teacher strikes:* Due to nationwide teacher strikes, classes were not in session for two or more weeks during the month of March, depending on the school. Additionally, local teacher strikes cancelled classes at (E) and (E+OCE) primary and JHS schools in mid-May. By reducing classroom instruction with the e-reader, teacher strikes may have affected outcomes of the study, particularly gains in standardized test scores. Additionally, teacher strikes may have made it difficult for students to seek help when facing technical problems such as accidental book deletion.

- *E-readers did not include reading materials for all school subjects*: As a pilot, the study did not aim to provide a fully integrated e-reader experience. As a general rule, Worldreader refrained from incorporating Math and Science subjects into this particular study because the diagrams and symbols associated with math and science do not display well on today's e-reader technology. Rather, Worldreader chose to focus on subjects that are more reading intensive (i.e., English and Social Studies). As a result of these decisions, Worldreader focused on students in the General Arts stream at the SHS level. At the primary and JHS levels, the project randomly chose the streams of students who would participate in the study. While e-readers contained content for English, Social Studies/Citizenship, and Integrated Science, they did not contain adequate content for other school subjects.

  Since not all subject content was digitized, the pilot study did not realize the full potential of e-readers in the classroom. If students had had e-textbooks for all of their class subjects, it would be expected that students would read more overall as part of their schoolwork and thereby experience greater gains in reading performance. Furthermore, a fully integrated e-reader experience would have been more cost effective for students, as families would not have needed to buy any paper textbooks.

- *Late start of OCE activities***:** Although ideally planned for September, OCE activities for primary and JHS levels did not begin until December 2010, and OCE activities for SHS students did not begin until February 2011. As a result, OCE volunteers had less than an entire academic year to build rapport with students, potentially limiting the anticipated positive effects on student reading performance.

- *Limited OCE Volunteers from May-July:* Worldreader recruited many OCE volunteers who were high school students from Lincoln Community School and university students from Ashesi University. Since these volunteers were on vacation during May-July, Worldreader had a lower volunteer to student ratio during that time, affecting the benefits of OCE activities.

- ***Limited class time at (E+OCE) JHS***: Low class attendance and reduced class time may have limited the impact of the e-reader on the (E+OCE) JHS students. The Worldreader Operations Manager observed that (E+OCE) JHS students were not in school during many of his weekly visits. Rather than attending classes, these students were frequently seen weeding plots of land during school hours. Additionally, the (E+OCE) JHS school buildings were used as a local educational examination center from 21st to 25th March 2011. As a result, classes were not in session that week, further reducing class time and interaction with the device. The degree of setbacks unique to this school was not noticed at any of the other schools in the study, and may affect the results of the study.

- ***Reduced access to e-readers outside of school for (E+OCE) SHS students:*** After the first two months of the project, Worldreader became aware that (E+OCE) SHS students were often bullied by older high school students to use their e-readers. In response, Worldreader and the school sensitized students to the need to allow project-affected students to primarily use the e-readers. For a few weeks, all (E+OCE) SHS students had to leave e-readers with project coordinators at the school to avoid bullying in dormitories or at home. By April, all students began taking e-readers home again.

- ***Delayed decision-making to split (E+OCE) SHS Students into streams***: Worldreader intended to provide e-readers to one stream of students at each grade level. However, the (E+OCE) SHS administration was not able to split its 105 students into two desired streams until February 2011. Worldreader was faced with the option of delaying the launch of e-readers at that school. Instead, Worldreader chose to pair students up and provide one e-reader to two students. Three months into the 7-month study, students were split into one manageable group of 50 students with a 1:1 student to e-reader ratio.

Socio-Cultural Limitations

- ***English language limitations***: While English is the official language of Ghana, it is the second language for most, if not all, project-affected students and teachers. English language limitations were especially significant for primary students who use English for the first time in primary class 4.

- ***Potentially unsupportive home environments***: As many project-affected students are from agricultural-based families, their home environments may not appreciate reading as an activity. For example, students may spend more time at home performing family chores and agricultural tasks rather than engaging with their e-readers. Additionally, students whose parents have limited English and literacy skills may be unable to actively incorporate the device into home life.

3. SUMMARY OF IREAD ACTIVITIES

In order to best understand the results of this pilot study, it is important to summarize and analyze the timeline of pilot study activities. The following diagram summarizes pilot study milestones.

Diagram 1.0 – Timeline Summary of Study Milestones
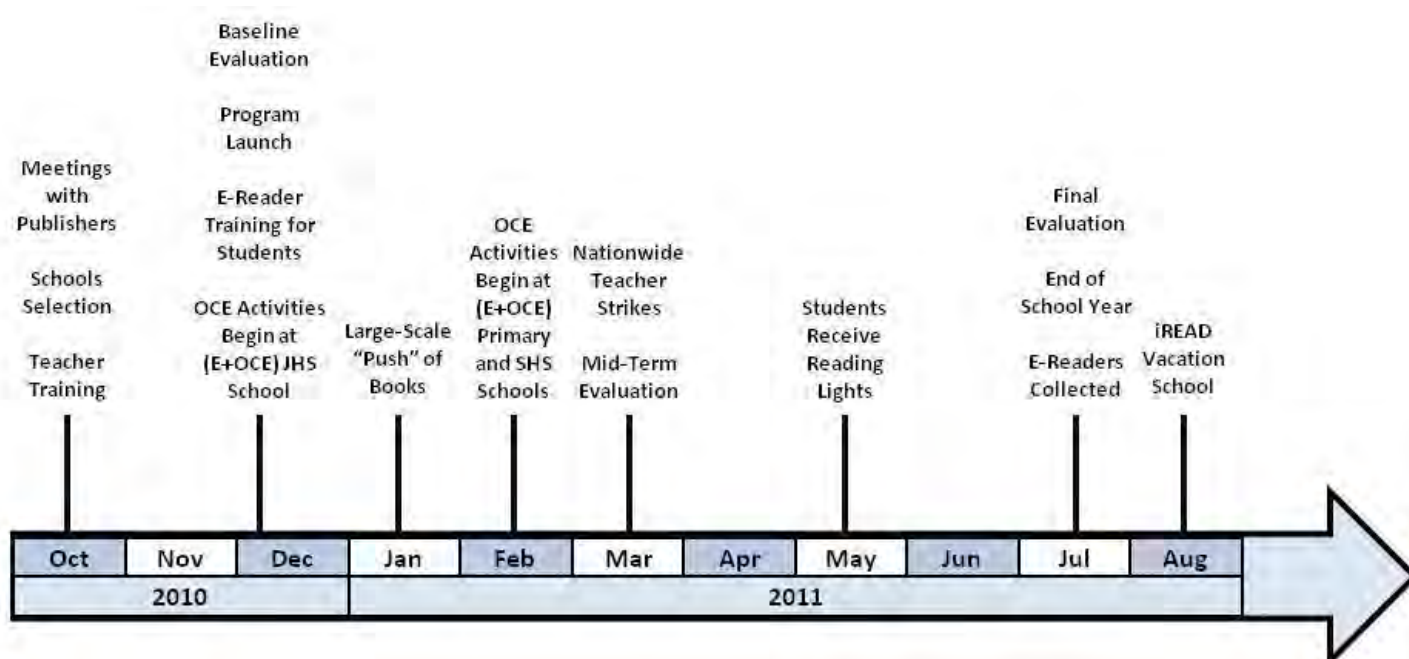
As with the start-up of any pilot, the iREAD project faced various challenges. Although it was beyond the control of the pilot study, it would have been more appropriate to launch the program in August 2010, at the beginning of the academic year. The fact that the program launch was delayed until early December 2010 was a major limitation of the study, as the potential of the e-reader was not fully realized. Similarly, given that out-of-classroom exploration (OCE) activities were an integral part of an experimental group, these activities should have started at the onset of the project. However, it was three months after the already late program launch before OCE activities began at the primary and SHS levels.

Throughout the pilot study, the Worldreader team carried out several participatory sessions with stakeholders and study participants. This approach was well received by participants and created a sense of ownership around the project. Another positive approach was that the iREAD program continually "pushed", or uploaded, books to students' e-readers on a weekly basis. In addition to the large scale "push" of books in January 2011, Worldreader pushed one to two books onto students' e-reader each week. Consistently receiving fresh and new materials kept students' interest in reading.

Worldreader developed a consultative relationship with Amazon, the leading e-reader manufacturer, as the organization grappled with issues such as whether to allow students to use the experimental multimedia aspects of the e-reader. Even though 43% of study participants had never used a computer, students quickly learned the multimedia aspects of the e-reader, such as music and internet features. At a classroom management level, teachers may have found multimedia to be distracting, but from a development standpoint, the e-reader could have potentially bridged the digital divide by allowing the 43% of students who had never used a computer access their first computer-like device. Worldreader continues to engage in dialogue with Amazon regarding pressing issues such as designing more durable e-readers and developing a more comprehensive e-reader management system that can better monitor e-reader usage and behavior. These approaches are commendable and scalable for future project implementation.

Worldreader's efforts to digitize Ghanaian and African literature are another praiseworthy and innovative aspect of the project. Findings within this report demonstrate that many students had an affinity towards African reading material because it was representative of their culture. A concern, however, is that many of the locally authored texts had grammatical, syntactical, and typographical errors that do not present a positive model for young readers. The evaluation team proposes recommendations to address these and other setbacks that arose during the timeline of the pilot study.

It is surprising to note that, throughout the entire study, only two e-reader devices were lost. During the exploratory phase of pilot study discussions, theft of devices was a major and critical concern. However, data from the pilot study reveal that theft was a minimal occurrence, primarily because strong community involvement was encouraged through e-reader pledges, community outreach programs, and support from community leaders. Device breakage, however, was not an initial area of concern for implementers or donors, yet the data from the study revealed a 40.5% breakage rate, which translates into 243/600 devices. As mentioned in the limitations section, this breakage may have affected the outcome of the study, as students had reduced access to the device while waiting for replacements.

Worldreader representatives report that they are not discouraged by the high e-reader breakage rate, explaining that one of the objectives of the study is to determine the sustainability of the e-reader in a developing country context given current technology, in order to make recommendations to modify the technology. Worldreader is optimistic that the breakage rate will improve. Every time an iREAD e-reader breaks, the device is sent to Amazon, where engineers conduct a post-mortem analysis to identify what caused the device to malfunction. These post-mortem analyses revealed that fragile screens are the main weakness of the device. As a result, Amazon is testing devices with more durable screens. By October 2012, the first shipment of e-readers with improved screens will arrive in Ghana. These reinforced screens will not raise the cost of the device, which is continuing to decline at this time.

In addition to improving the device itself, Worldreader is also working to secure more rugged e-reader cases. Also, Worldreader plans to implement a new policy towards e-reader breakages for the 2011-2012 school year. Under this new policy, after a student breaks an e-reader for the first time, the student will receive a verbal warning at a conference with his or her parents, teachers, and a Worldreader representative. After the warning, the student will receive a replacement e-reader. However, if the student breaks an e-reader a second time, he or she will not receive a replacement device, and will be transferred to a stream of students without e-readers. Worldreader hopes this policy is strict enough to encourage students to take care of their e-readers, but lenient enough to allow for breakages that are the fault of the device itself and not the fault of the student.

In August 2011, the iREAD Vacation School created an opportunity to gain back time lost during the school year due to the late start of the project, teacher strikes, and other unanticipated events. In total, 178 students participated in the voluntary summer reading program. It is interesting to note that 47% of participants were from the study, while 53% were not, demonstrating the growing enthusiasm of students for using the device to gain access to reading materials. The pilot study's flexible OCE approach allowed for the introduction of new program ideas throughout the study, including the actual conception of the iREAD Vacation School, as the study progressed. A major drawback of this program, however, was that student progress was not measured.

A more detailed description of iREAD activities across the duration of the pilot study is outlined below.

DETAILED DESCRIPTION OF iREAD ACTIVITIES

Leading up to October 2010, Worldreader set the groundwork for the iREAD Ghana Study. Worldreader began agreements with several publishers, which granted Worldreader permission to use their books as part of the iREAD Ghana Study. Worldreader has digitized books from several Ghanaian publishers, and made these books available at Amazon's Kindle Store. Worldreader's Ghanaian and West African publishing partners are as follows:

- Sub-Saharan Publishers
- Regener8
- Smartline Publishing Ltd.
- EPP Books Services Ltd.
- Sam Woode Ltd.
- Woeli Publishing Ltd.
- Afram Publications Ltd.
- Evans Brothers Ltd.
- Adwinsa Publications Ltd.
- Sedco-Longman Publishing Ltd.

Worldreader is committed to digitizing local Ghanaian books, believing that students will learn to appreciate reading when they have books that relate to their own culture and surroundings. In addition to local publishers, Worldreader also developed partnerships with international publishers Random House Inc. and Penguin Books. Additionally, a number of international and African authors contacted Worldreader directly to donate books.

The iREAD 2010-2011 pilot study only included 8 digitized textbooks. According to the President of Worldreader, the current agreements established between Worldreader and certain publishers limits the number of available textbooks. At this time, Worldreader is asking publishers for free use of their textbooks during the study, in exchange for digitizing the textbooks for free. Some publishers, who rely heavily on textbooks for their income, are reluctant to donate their books. For the 2011-2012 school year, however, Worldreader aims to provide students with 60-70% of their required textbooks through the e-reader.

The Worldreader President estimates that a payment mechanism might be established perhaps two years or more from now, after the pilot phase of iREAD is complete, e-reader breakage issues are addressed, and the government and schools are comfortable with the e-reader. At that time, publishers could sell e-books at prices that are significantly lower than paper books prices, and still make a greater profit due to reduced logistical costs, eliminated paper costs, and a wider access to customers through the e-reader. However, until the pilot phase of the iREAD program is complete, Worldreader hopes that publishers will continue to support the iREAD program by providing free books.

In October 2010, Worldreader finalized (E) and (E+OCE) school selection and began training teachers. Teacher training involved two major components – 1) training on the functional use of the e-reader and 2) training on incorporating e-readers into the classroom. Training on the functional use of the e-reader focused on navigating the device and ensuring that teachers felt comfortable using the e-reader before the devices were introduced to students. Training on incorporating the e-reader into the classroom focused on lesson planning, identifying aspects of the syllabus that could benefit from use of the e-reader, and developing specific activities and teaching methods that could make effective use of the e-reader.

In late November and early December 2010, Worldreader launched e-readers among (E) and (E+OCE) students. Before receiving e-readers, students and their families were invited to a launch event. At this launch event, leaders in the community and representatives from Worldreader spoke in both English and Twi on the significance of the iREAD Ghana Study and the importance of reading. Students and their parents signed pledges promising to make effective use of their e-readers and to keep the devices safe. In the week following the launch, teachers trained students in the functional use of the e-reader. Although there was initially some concern that primary students might not be mature enough to take their e-readers home, within a week of the launch, teachers trusted primary students to take their devices outside of school. Shortly before December/January vacation, volunteers from Lincoln Community School began OCE activities at (E+OCE) primary and JHS schools.

In January 2011, Worldreader implemented a large scale "push", or upload, of books, in which Worldreader provisioned books over a wireless connection onto students' e-readers. Prior to this large scale push, e-readers were pre-loaded with approximately 15 books and Worldreader had pushed an additional one to two books every week via mobile phone signals. Since mobile phone signals were not suitable for sending large amounts of books, Worldreader collected all e-readers, transported the devices to Accra, and pushed about 70 additional books onto the e-readers via high-speed wireless internet connections available in the capital city. After the large scale push, Worldreader continued to push 1 to 2 books weekly over the GSM mobile phone network.

In February 2011, volunteers from Ashesi University and the Writer's Project of Ghana began working with (E+OCE) students on Saturdays as part of OCE activities. In general, OCE activities took place at (E+OCE) schools on Saturdays. The project coordinator, along with other volunteers, developed activity plans that used the e-reader to enhance literacy by focusing on reading comprehension and grammar.

Sample OCE activities include[5]:

- Reading books with students and then asking reading comprehension questions, with small prizes for correct answers.
- Asking students to identify certain parts of speech within the stories on their e-readers.
- Quizzing students on listening comprehension.
- Prompting students with open-ended higher level inference questions. For example, students were asked to predict what might happen next, why a character may have acted a certain way, etc.
- Writing short stories and poems.
- Writing responses to the books. For example, after reading Meshack Asare's *The Canoe's Story*, students wrote letters to the author. Exemplary letters were displayed on Worldreader's blog.
- Giving inspirational lectures on reading, writing, exam-taking skills, and pursuing one's dreams.

In March 2011, one of Worldreader's co-founders held a feedback workshop with (E) and (E+OCE) teachers in which teachers shared their challenges, suggestions, and best practices regarding the e-reader. For most of April 2011, students enjoyed an end-of-semester vacation. In May 2011, Worldreader distributed flashlight attachments so that students could read after sunset, even if they did not have access to electricity.

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[5] Details on OCE activities, as well as sample lesson plans, are presented in Appendix A.

In June 2011, Worldreader piloted the use of a solar charger for the general usage e-readers in the field. Worldreader hopes that in the future, solar chargers would allow students to recharge their own devices, eliminating queues at local charging stations. In June, Worldreader also implemented a system to automatically register and re-register devices that have been accidentally de-registered. Previously, students who accidentally de-registered their e-readers were unable to download any new material until the e-reader was manually re-registered.

From 19–23 July 2011, Worldreader collected e-readers from the students before the close of the academic year in order to avoid losing devices, as students frequently change schools over vacation. Initially, Worldreader hoped students could take e-readers home over the summer vacation but this approach was ultimately rejected as impractical. In order to provide students with continued access to e-readers in a more feasible manner, Worldreader instead organized iREAD Vacation School. Under this program, five teachers from (E) and (E+OCE) school supervised e-reader use from 8am-1pm, Monday through Friday, from 1 August to 3 September 2011. During this time, students could come to their schools and borrow an e-reader from the supervising teacher to read whatever material they chose. Occasionally, teachers initiated extra activities such as book discussions and spelling competitions.

Approximately 178 students attended iREAD Vacation School. Roughly half of the attendees were students who participated in the iREAD study and who had e-readers during the 2010-2011 academic year. The remaining half of attendees consisted of students who were either enrolled at (E) and (E+OCE) schools but were not part of the pilot study, or students who were enrolled in different schools. As a result, the benefits of e-readers expanded beyond the students who were part of the initial pilot study.

Throughout the duration of the project, the Worldreader Operations Manager visited (E) and (E+OCE) schools on a weekly basis to provide program support, including troubleshooting technical difficulties, organizing OCE activities, addressing breakage issues, meeting with teachers, and responding to program concerns. Worldreader staff based in Spain regularly visited schools every few months.

Throughout the project, Worldreader also engaged in ongoing dialogue with Amazon to adapt e-readers to Ghanaian classrooms. Worldreader discussed a range of issues with Amazon, including:

- Developing more durable e-readers with sturdier screens and other adjustments that would reduce breakages.
- Controlling e-reader functions that distract students or that are problematic. For example, Worldreader is exploring ways to limit functions on the e-reader such as music and internet.
- Designing an e-reader management system that can control and monitor large numbers of e-readers on one account so that, for example, all 87 (E) and (E+OCE) primary students could be connected to one single account. In the current system, only five e-readers can be connected to one account.

Worldreader plans to continue iREAD programming with the (E) and (E+OCE) students who participated in the 2010-2011 pilot study. While the pilot study focused on primary 4, JHS 1, and SHS 1 students, the iREAD program for the 2011-2012 school year will continue with the same students, who will have advanced to primary 5, JHS 2, and SHS 2.

Worldreader is in the process of securing textbooks appropriate for primary 5, JHS 2, and SHS 2 levels. In order to maximize the e-reader's integration into the curriculum, Worldreader plans to

extend the number of school subjects that the e-reader will cover. While the pilot focused on English, Social Studies/Citizenship Education, and Integrated Science, the 2011-2012 program will add other subjects such as Religious Moral Education, Ghanaian Language, Information Communication Technology, Government, and Economics. Worldreader hopes to make 60-70% of required textbooks available on the e-reader.

Inspired by the success of iREAD Vacation School, Worldreader additionally hopes to promote the habit of reading through afterschool reading clubs. Teacher feedback on iREAD Vacation School revealed that the program is the first opportunity teachers have had to observe and assist students while they read materials the students have chosen for themselves. During the school year, students read required materials together as a class, but the curriculum does not allow time for individual reading during the school day. Furthermore, at home, students may not develop the habit of reading for pleasure because they are concentrating on agricultural chores and other activities. Teachers praised the iREAD Vacation School for creating an environment that encourages a culture of reading.

Worldreader is therefore working with teachers to explore the possibility of one-hour long after school reading club sessions that would take place two to three times a week. During club sessions, students would read individually for pleasure while a supervising teacher is available to clarify phrases or otherwise assist students as needed. Worldreader recognizes that parents may want students to come directly home after school, especially if students live far away from the school, potentially posing a challenge to the afterschool reading clubs. Worldreader is considering organizing a meeting for parents that explains the purpose of the clubs in order to gain parental support.

Finally, Worldreader is recruiting additional staff to support the iREAD program for the upcoming school year. For example, Worldreader will secure an iREAD Fellow to support the Operations Manager with on-the-ground work in Ghana.

4. FINDINGS & ANALYSIS

Overall, students and teachers from the iREAD Ghana Pilot Study had positive experiences with the e-reader.

Feedback from the mid-term and final evaluation supports the general sense that the e-reader has a role in the future of the Ghanaian public school curriculum. Data from the pilot study reveal that there are short-term, medium-term, and long-term benefits to incorporating e-readers into the Ghanaian public school system.

Primary among the short-term benefits is that students have immediate and reliable access to books for academic and personal use. In contrast to the undependable delivery of paper books, e-books arrive instantly and transparently onto students' devices through mobile phone technology. In the medium-term, students and teachers have access to reading materials and teaching resources that facilitate and significantly accelerate the learning process, since students are able to have direct access to information in a home setting. This gives students and teachers the opportunity to extend learning beyond the allotted class time. Unlike the current scenario where primary and JHS students cannot take school textbooks home, the e-reader provides the opportunity for extended reading and homework assignments beyond class time.

In the long-term, final evaluation data strongly suggests that when the device is introduced and managed properly among primary-level students, it has the potential to improve reading performance, and more importantly increase enthusiasm for reading as a lifelong habit. Therefore, the e-reader has impact along a continuum of short- to long-term effects.

There were also many challenges to the management of e-readers within the pilot study. These experiences can serve as lessons learned for future project implementation. The study identified breakage as the greatest project concern, as almost half of e-readers experienced some breakage. In terms of the study's limitations, major concerns were that the sample of students was not geographically representative and that time exposure to the tool was greatly reduced due to challenges such as teacher strikes and a delayed project start date.

The aim of the Findings section is to share a detailed account of the effects of the e-reader on study participants in terms of access to books, skills gained, and reading performance within the overall Ghanaian academic experience. Additionally, the evaluation team identified and analyzed unanticipated results that occurred within this pilot study.

Findings are presented in the following 7 major categories:

- Understanding socio-economic data in context
- Access to books
- Attitudes towards reading
- Technology skills gained
- Reading performance on standardized tests
- Unanticipated results
- Factors affecting sustainability

4.1 UNDERSTANDING SOCIO-ECONOMIC DATA IN CONTEXT

Results from the pilot study reveal that the e-reader has affected reading performance most significantly at the primary school level than at any other grade level. Data from the baseline revealed that the average age across the groups was 11.1 years at the primary level; 13.5 years at the JHS level, and 16.6 years at the SHS level. Therefore, within this study, age and grade level correlated to the success of the device and served as a principal social factor.

From socio-economic background data collected from the baseline in early December 2010, the ILC Africa M&E team concluded that 50.0% of parents in the (E) primary group were from agricultural backgrounds as compared to 15.6% in the (E+OCE) group. Recent standardized test results suggest that primary students from non-agricultural backgrounds may have benefitted more from the e-reader than students from agricultural backgrounds. This finding requires further investigation and confirmation, but if true, it can pose serious challenges for implementation in average Ghanaian public schools. Agriculture is one of the country's most popular and prominent sectors, involving most Ghanaians as a general way of life. Data from the pilot study suggests that family responsibilities to carry out agricultural activities hindered the ability of students from agricultural backgrounds to fully capitalize on the device in their home setting. This setback may need to be explored further if scaling up e-readers at a national level is to happen in the near future.

The evaluation team also found a correlation between the most successul reading performance group and mothers educated beyond SHS. The best performing group for reading comprehension ((E+OCE) at the primary school level) had 4.9% of mothers' education levels at 'higher than SHS'. In comparison, the next best student group ((E) at the primary school level) had 0% of mothers' education levels at 'higher than SHS'. Mothers with education beyond SHS may have been more likely to assist children with homework and reading activities outside of school, enhancing the effectiveness of the e-reader. [6]

Another noteworthy aspect of socio-economic data is that the primary school group with the best testing performance, the (E+OCE) primary group, had a dominating Ewe culture in terms of language and ethnicity. There may be particular cultural attitudes and beliefs towards education and reading within the Ewe culture that differ from other sub-cultures. However, this theory could only be validated if the study were to be carried out in a predominantly Ewe environment as opposed to other environments.

It is interesting to note that the best performing primary group (E+OCE) were students who spoke very limited English at home, whereas a higher percentage of (E) primary group spoke English at home. To add, 95.5% of (E+OCE) primary students reported that they had stopped going to school for a period of four months or more. However the (E+OCE) primary collectively performed better than the (E) primary group, which reported a 74.4% school interruption rate. This suggests that students with inconsistent attendance rates and heavy periods of school interruption were still able to maximize the benefits of the tool. The effects of school interruption may be due to the fact that English only started at primary class 4, and therefore students may not have experienced any major gaps in learning English.

At this time, it is still difficult to draw definitive conclusions regarding the relationship between socio-economic backgrounds and standardized-testing performance growth using the e-reader.

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[6] Analysis of change in standardized test scores from baseline to final by mothers' highest level of education is found in Appendix L. The current analysis consists of low sample sizes and does not demonstrate any clear trends.

In the future, larger studies involving randomized clinical trials could provide more insight into these issues.

4.2 ACCESS TO BOOKS

A major finding of the baseline evaluation was that students had significantly limited access to textbooks and books at home. While JHS and SHS students did have access to books through their school libraries, their access to library books was generally limited to library premises and school hours. Additionally, since libraries stocked only one or a few copies of each title, libraries provided supplementary materials but did not provide sets of textbooks for entire classes to use.

Primary and JHS teachers reported that for many subjects, there were insufficient numbers of textbooks. Sometimes two students had to share one book, while at other times, as many as three or four students had to share one book. Additionally, certain subjects such as Religious & Moral Education did not have any textbooks, forcing teachers to research materials on their own. No primary or JHS student in the study was permitted to take school textbooks home. As a result, primary and JHS teachers could not assign reading homework to students.

At the SHS level, access to government textbooks was similarly limited. For example, one high school only owned 10 copies of the government Integrated Science textbook for the entire student body. Also problematic was that government textbooks often arrived late, sometimes five months into the school year. However, SHS schools ensured access to textbooks by requiring students to buy private textbooks as part of tuition. Due to this mandatory billing system, SHS students had access to more textbooks than primary and JHS students, and could take textbooks home.

Data from the baseline evaluation also revealed that outside of the e-reader, students had a limited amount of books at home. Primary students reported having the fewest books with an average of only 3.6 books, where JHS had 8.6, and SHS had 11.0. SHS students most likely had more books than younger students because they were billed for textbooks that they could take home. Reading interventions can have the most effect on a student's academic potential during the primary years; however, it was observed in the baseline that students had access to the least amount of books during this time.

The baseline evaluation found that project-affected primary schools did not have libraries, although occasionally, Non-governmental Organizations (NGO's) supplied supplementary materials for students to keep and take home. JHS schools did have libraries with single copies of fiction books, and JHS schools even held library periods once or twice a week during which students were encouraged to read books and request books to take home. However, library books were generally storybooks unrelated to specific course syllabi, so some teachers preferred to cover additional course material during library period rather than devote time to fiction books.

At the SHS level, schools had well-stocked libraries. However, schools did not permit students to take library books outside of the library. The librarian at the (E) SHS reported that the school library contained roughly 2,000 books, approximately 1,000 of which are textbooks and 1,000 of which are fiction books. In addition to these books, the library also contained newspapers. At the (E+OCE) SHS, the librarian estimated that the library contained around 900-1000 books, 700-800 of which are textbooks, and roughly 200 of which are fiction books. He estimated that there were about 10 government books per school subject, although books for certain subjects like Agriculture were outdated.

In contrast to school libraries, the introduction of the e-reader offered immediate access to a large number of up-to-date reading materials that each student could read in the classroom and at home. Not only were students provided access to mandatory textbooks, but they also gained access to a wide selection of books, magazines, and articles of all genres.

Amazon account data revealed that (E) and (E+OCE) students had a cumulative total of 31,432 complete materials on their e-readers, averaging 107 books per student. Complete materials include books that Worldreader "pushed" onto e-readers, as well as free complete books that students "pulled" or downloaded on their own. In addition to complete books, students also had access to free samples of books, sample subscriptions, and the internet on the e-reader.

Worldreader provided (E) and (E+OCE) students with e-textbooks for their grade level on the individual e-readers. Worldreader provided 8 textbooks on the e-reader, covering the subjects of English, Citizenship Education/Social Studies, and Integrated Science.[7] (E) and (E+OCE) students also had access to:

- Local storybooks (*The Shark*, *Ananse and the Pot of Wisdom*, *At the Beach*, and others)
- International storybooks (*Gulliver's Travels*, *Treasure Island*, *Magic Tree House Series*, and others)
- Educational games (*Every Word*)
- The e-reader's English dictionary

The introduction of the e-reader allowed teachers access to books that they had not had in the previous years. Teachers were able to confidently "push" textbook materials and supplementary materials to students without concerns about access and cost for the student. In addition to the provision of e-textbooks, Worldreader provided teachers with various supplemental materials on the e-reader that they had not used the year before.

Teacher weekly logs revealed that (E) and (E+OCE) group teachers reported actively using the e-reader for approximately 34% of class time. This establishes the integration of the e-reader into school curricula. During teacher interviews, many (E) and (E+OCE) teachers described that they often began classes by introducing a topic and then asking students to use their e-readers to read sections of the digitized textbook. Teachers sometimes asked students to read e-reader passages silently, while other times they asked students to read aloud together as a class. Then, teachers frequently reinforced reading comprehension by having students answer questions based on the passage. Other teachers expanded upon certain points made in the passage and gave supplementary notes. One primary school teacher designated Fridays as the day when students read an e-reader story aloud together. Science teachers mentioned that they sometimes integrated the e-reader into the classroom by having students open up to a particular diagram. Additionally, several teachers mentioned that the dictionary function on the e-reader was highly valuable as students could immediately expand vocabulary without having to reference a physical/paper dictionary.

The effects of having access to more books than the previous year was appreciated at the student level and the teacher level. Major advantages to having the device included:

Improved Lesson Planning. Teachers found the e-reader very useful in preparing for their lesson plans. Teachers had more resources to draw upon when planning lessons. The e-reader allowed teachers to conduct background research, create lesson notes, and design reading

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[7] See Appendix B for details on the 8 textbooks,

comprehension assessments for students. As several teachers expressed, they no longer relied solely on the few outdated textbooks that were previously available. Additionally, the e-reader was light and portable, so teachers no longer had to search through libraries, pay to use internet cafes, or carry heavy books away from the school premises. Since their work was made more efficient and easy, teachers reported having more time to develop the subject matter content of their lessons.

In terms of lesson delivery, an analysis of 104 teacher weekly logs indicated that (E) and (E+OCE) teachers used teaching methods or lesson plans from Worldreader's teacher training sessions for 49% of weeks. Some of the methods and lesson plans that teachers reported using include the following:

- Reading aloud method to test the reading ability and fluency of students.
- Discussion method to promote active participation,
- Child centered method in which a student leads the class rather than the teacher.
- Group method in which students work together and help each other.
- Competition method, i.e. students competed to find the meanings of words in a particular e-book.
- Indicating locations on the chalkboard so that students could follow along more easily.

Encouraging Student Participation. Teachers also praised the e-reader for helping students to contribute to class discussions. Since students had direct access to information, students took turns acting as the "teacher" by standing in front of the class and sharing what they learned from reading assignments. Such participatory lessons engaged students, increased their retention of concepts, and built their self-confidence. Several students in focus group discussions expressed that e-readers made their classes more interesting and educational, particularly English classes. Teachers also observed that the e-reader helped students to understand the importance of supporting their ideas with specific facts and evidence. Because they had access to the e-reader, students were able to conduct research and cite the sources of their information.

Facilitating Learning at Home. Teachers also added that with the introduction of the e-reader, they could cover the syllabus faster and more in-depth than previous years. Since students could prepare for classes, they were familiar with topics, making it easier and faster for teachers to explain concepts. Furthermore, teachers encouraged students to refer to their e-reader textbooks when they were at home reviewing their class notes, so that if students came across concepts they did not remember well, they could read the textbook's explanation.

Teachers also noted the following challenges associated with incorporating e-books into the classroom:

Distraction. In primary classrooms in particular, teachers noted that making sure all of their young students were on the right page in an e-book could be time consuming. At all grade levels, a very common complaint was that students spent too much time using the e-readers for entertainment purposes such as listening to music. One teacher mentioned that during class, some students played e-reader games rather than focusing on the lecture. Another teacher noted that students lost focus because of the overwhelming amount of information on the e-reader.

Over-Dependence on the E-Reader. Many teachers also complained that students had become overly dependent on the e-reader. For example, one teacher stated that students

thought that everything on the e-reader was the "absolute truth." He had to correct them by explaining that the e-books may contain mistakes just as paper books do. Teachers also observed that some students have started to favor classes that use the e-reader and neglect classes that do not. Similarly, we also observed that some teachers may also have become overly dependent on the e-reader. Some teachers appeared to devote more time and energy towards planning e-reader classes than non-e-reader classes, and tended to have lower expectations for non-e-reader student performance. Furthermore, we observed that some teachers used e-books even when equally useful paper textbooks were available. Therefore, teachers may need to better appreciate the purpose of the e-reader.

Technical Difficulties. At times during the study, problems with e-reader devices disrupted class lessons. High rates of breakages and permanent freezing forced students to share devices. Similarly, electrical charging issues led to temporary sharing. Some teachers also expressed frustration with accidental book deletion and de-registration, which prevented all students from having the same set of books. As a result, when teachers would ask students to turn to a certain location in an e-book, they realized that not all students had that particular book on their devices.

Finally, it is important to note that while the e-reader provided more reading materials for teachers and students, there were many other pressing challenges outside the scope of the e-reader that may have negatively affected the quality of classroom education in the pilot study. These challenges included:

- Student to teacher ratios were high, making it difficult for teachers to manage large classes, provide individual attention, and cater to the needs of students with varying levels of capability.
- The classroom environment was limited in terms of classroom space, desks, and infrastructure.
- Teachers lacked educational materials such as abacuses, lab equipment, measuring tools, and visual aids.
- Students had difficulty with the English language, which was a second language for most students.
- Class time was not enough to cover the syllabus, especially considering that students were often tardy and their attendance was inconsistent.
- Students' home lives and personal lives detracted from their studies, especially their agricultural duties and responsibilities.

4.3 ATTITUDES TOWARDS READING

Data from online Amazon accounts demonstrated that students were actively downloading materials on their own, indicating that students were enthusiastic about reading and seeking reading material that interested them. Focus group discussions revealed that students had no difficulty in accessing reading material, and a majority of students expressed that they never became bored of the e-reader.

While Amazon online data, student attendance at voluntary reading activities, and self-reported student log data suggested increased general student enthusiasm towards reading, teachers observed that some students were less enthusiastic. Students whose e-readers broke were disappointed by the breakage and soon lost interest. Some teachers also commented that although initial enthusiasm was high, students lost morale when their e-readers would freeze.

According to many students, another factor affecting enthusiasm was the 'hassle of charging e-readers.' One teacher added that some students were less motivated to use the e-reader at home because of families' pressure to focus on household chores and other activities over reading. Despite these setbacks, however, teachers agreed that for the most part, students demonstrated increased levels of excitement towards reading.

Table 5.0 (below) shows that on average, each student downloaded 21 books on his or her own, demonstrating strong student interest in accessing additional information beyond the material that was already provided. The online Amazon account data provided a more accurate picture of students' downloads than self-reported student logs.

Table 5.0 – Number of Complete Books Per Student*

	No.	%
Books "pushed" by Worldreader	26256	80%
Complete books & downloads "pulled" by students themselves	6380	20%
TOTAL ("pushed" + "pulled" books)	32636*	100%
	No.	%
Average number of "pushed" books per student	86	80%
Average number of "pulled" complete books & downloads per student	21	20%
AVERAGE TOTAL BOOKS PER STUDENT ("pushed" + "pulled" books)	107*	100%

This table only provides figures on complete books. It does not include free samples of books or sample subscriptions of newspapers and magazines that students downloaded on their own.

In addition to complete books, students also downloaded a wealth of subscriptions and free samples of books. Data from students' last 10 downloads indicated that "News," "Fiction & Poetry," "Magazines, Blogs, and Other Subscriptions," and "Games" were the most popularly downloaded genres of content.[8] Even though most students preferred Ghanaian storybooks, materials of international interest increasingly became popular among students. E-readers also provided students with a greater international reach of reading material. Amazon data revealed that students were downloading *The New York Times*, *USA Today*, and *El País* etc., demonstrating that students wanted to access a wide range of reading materials that were previously inaccessible.

Students "accessed" books by opening and presumably reading at least some of each book. Student log data revealed that students self-reported accessing a significantly higher number of e-reader books than paper books. The ratio of e-books to paper books was greatest at the primary level, perhaps because primary level reading materials are short and can be read quickly. The ratio was lowest at the SHS level, probably due to SHS students reading required paper textbooks. Ratios are not applicable for the (NE) group because they did not have access to e-books. Although this data is dependent on self-reporting and may not be entirely accurate, it is a general reflection of student reading behavior.[9]

Table 6.0 Ratio of Paper Books to E-books

Level	(NE) Group	(E) Group	(E+ OCE) Group
Primary	NA	1:20	1:11
JHS	NA	1:7	1:8
SHS	NA	1:4	1:3

(n=5103)

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[8] More details on student reading preferences are available in Appendix C.

[9] Further details on student self-reported data is available in Appendix D.

High student participation rates in voluntary reading activities organized by Worldreader also demonstrated a high level of enthusiasm towards reading. Student feedback on OCE activities was also quite positive. The Worldreader Ghana operations manager estimated that almost more than half of the students in each grade attended OCE sessions on a regular basis, while other students came only on some Saturdays. In focus groups discussions, students expressed that they wanted OCE activities to take place more often and several times a week, especially for students who were not available to attend on Saturday mornings. Students reported that they enjoyed interacting with volunteers and receiving advice and mentoring. According to a Worldreader estimate, about 15-20 primary students, 17-20 JHS students, and 20-30 SHS students were usually in attendance at the sessions which lasted from 9am until 12pm on Saturdays.

Additionally, voluntary participation was high in iREAD Vacation School, a voluntary reading program over the summer months. Attendance records revealed that 178 students in total participated in the iREAD Vacation School. Forty-seven percent (84) of attendees were students who participated in the iREAD study and had e-readers during the 2010-2011 academic year, while 53% (94) attendees were other students who were either enrolled at (E) and (E+OCE) schools or from different schools.[10] Since 84 out of a potential 337 (E) and (E+OCE) students attended iREAD Vacation School, there was a 25% participation rate among project-affected students. The 25% participation rate, however, must be understood in the context of the school: most senior high school students were boarding school students and thus not available to attend the vacation school. Nonetheless, one fourth of treatment group students valued reading highly enough to dedicate substantial free time over the summer for reading activities. It is also important to note that the high participation of students from outside of the study suggests that iREAD interventions are creating a culture of reading in the entire community and benefiting students beyond the scope of the study.

APPRECIATING CASE STUDIES

It is also valuable to appreciate student experiences on a one-on-one basis through case studies. Such case studies allowed the evaluation team to see qualitative examples of students flourishing or not with the e-reader.

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[10] See Appendix E for details on student participation by grade level.

Student Enthusiasm Towards Reading – Case Studies

- Since receiving the e-reader, **Bismark Amoah**, an (E) JHS student, began reading more often. He especially enjoyed newspapers and magazines, because he wanted to understand current events. Bismark shared that reading on the e-reader improved his spelling and reading speed, but that he still needed to work harder to improve his speaking skills.

  *SCORES: Baseline: 34%, Mid-Term: 28%, Final: 33%; **Percentage Change: -1%***

- An anonymous SHS student saw reading as a means to becoming independent. He especially enjoyed reading inspirational stories that taught real life lessons on the e-reader. He explained that before the iREAD program, many of his peers had negative attitudes towards English and reading. The student recalled that if someone read often, his peers would accuse the person of being arrogant, saying, "You think you know everything?" The e-reader's special status as a technological gadget changed these negative attitudes by making reading seem "cool."

- Teachers and members of the evaluation team observed that **Linda Beyir**, a JHS student in the (E) group, seemed indifferent towards the iREAD project. When her e-reader broke, she went without an e-reader for three months before the device was replaced. While Linda did not express anything explicitly negative about the program, it appears that e-reader breakage discouraged her. Outside of the e-reader, Linda reported that she had access to 6 paper school books, as well as paper newspapers that her father bought regularly.

  *SCORES: Baseline: 28%, Mid-Term: 20%, Final: 49%; **Percentage Change: +20%***

- **Gifty Asare**, an SHS student from the (E) group, used the e-reader's dictionary on a daily basis to look up unfamiliar vocabulary and phrases. She enjoyed reading the subscription "Story Books Express Daily" and books related to ancient Greece. She reported spending two hours on the e-reader each day, one hour of which was spent reading, and the other hour of which was spent browsing the internet or playing educational games. The only time she became frustrated with her e-reader was when it froze occasionally.

  *SCORES: Baseline: 25%, Mid-Term: 39%, Final: 47%; **Percentage Change: +22%***

- The e-reader helped **Mary Baidoo**, an SHS student from the (E) group, discover her love of reading. Through the e-reader, she gained access to many stories that interested her, and now she reads many books both on and off the e-reader. She shared that she typically spends 30 minutes reading every day, and that reading is easier and faster for her now than at the beginning of the year. For about a month, she did not have an e-reader because her device broke and needed repair. However, she did not lose interest in reading during that time.

  *SCORES: Baseline: 34%, Mid-Term: 19%, Final: 33%; **Percentage Change: -1%***

- **Philip Ofori,** an (E) SHS student, spent about 50 minutes reading each day. He enjoyed using the e-reader to access storybooks and play games, particularly word games. He said he liked reading sports books, and since there are not many sports books on the e-reader, he often used the e-reader to visit sports websites.

  *SCORES: Baseline: 31%, Mid-Term: 37%, Final: 58%; **Percentage Change: +26%***

It is surprising to note that in the case studies above, unenthusiastic students experienced growth in scores while some of the more enthusiastic students did not. Linda Beyir's scores jumped 20% between the baseline and final; however, she was the case study student who was the least interested in the e-reader. In contrast, Bismark Amoah did not improve in terms of test scores, even though his attitudes towards reading were very positive. Perhaps Bismark's self-reported improvement in spelling and reading speed did not necessarily translate into the essay writing and reading comprehension skills measured by standardized tests. Mary Baidoo's test scores similarly did not improve, despite her daily reading habits. In Mary's case, e-reader breakage may have contributed to her lack of growth. Additionally, it is possible that interview bias prevented Bismark and Mary from fully expressing their attitudes towards reading.

4.4 Technology Skills Gained

The baseline evaluation established that students had limited access to technology outside of the e-reader. A staggering 43.0% of students had never used a computer at the time of the baseline. In accessing the e-reader, 100% of (E) and (E+OCE) students had daily exposure to technology. This gave them practical communication technology skills that they might eventually apply to computers. The e-reader also provided students with access to the internet. After receiving the e-reader, 43% of (E) students and 34% of (E+OCE) students reported using the internet on the e-reader "often" or "very often."

Although there are concerns that students might use the internet for non-educational purposes like Facebook, teachers and students report academically useful activities, such as using Google and other websites to conduct research.

4.5 Reading Performance on Standardized Tests

Initially, it was anticipated that reading scores would be the critical indicator of program success. As the project progressed, however, it became clear that growth in reading comprehension was incremental. It may take longer than the estimated 7 months of exposure to appreciate a significant impact in reading performance.

Education research experts such as Robert Granger, Thomas Kane, and Harris Cooper agree that, in general, performance in reading improves more slowly than performance in other subject areas, such as math. While improvement in math scores relies primarily on classroom instruction, improvement in reading is highly dependent on factors beyond the classroom, such as family background. In discussing approaches to evaluate American afterschool programs, Granger and Kane advise that "even if the programs are helping, effects on achievement tests are likely to be hard to detect statistically. We should balance a focus on test scores with an examination of intermediate effects —more parental involvement in school-related activities, more diligent homework completion, more school attendance, and better grades, for example— which may pay off in improved test performance over time."[11] Therefore, the following analysis of test scores must be appreciated with the knowledge that it may be unrealistic to expect dramatic increases in reading scores after only 7 months of e-reader exposure.

However, the scores do begin to point toward trends in increased reading competency, namely at the primary school level. Students were administered baseline, midterm, and final examination to determine growth, if any. An analysis of test scores across all groups along the continuum of the project reveals that student reading was affected almost exclusively at the primary level, and not at the junior and senior levels. This conclusion supports external data that students are most affected by reading interventions at the primary school stages between the ages of 4 and 10.[12]

Table 7.0 summarizes the result for 309 (n*) students, who were consistent in taking the test from the baseline to the final test at the three different levels of education. The evaluation team

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[11] "Improving the Quality of After-School Programs," *Education Week*, February 18, 2004.

[12] See Appendix K for a select list of studies supporting reading interventions for younger students.

customized and administered the English Language sections of regional/national standardized tests that reflect local curricula. Specifically, the team administered the following:[13]

- School Education Assessment (SEA) for primary students,
- Basic Education Certificate Examination (BECE) for junior high school students
- West African Senior School Certificate Examination (WASSCE) for senior high school students

A critical assessment of the table indicates consistent improvement in the (E) and (E+OCE) groups at the primary school level. To be sure of the results, the evaluation team conducted t-tests to confirm the statistical significance of mean scores. This means that the percent change in test scores is true and not the result of random differences in calculations across time.[14] The improvement was greatest in the (E+OCE) primary group at +15.7% and the (E) group at +12.9%. Although there was an obvious trend of growth across all students groups, the impact was minimal at the junior and senior levels because the control groups also improved. So, the evaluation team was unable to attribute growth at the junior and senior levels to the e-reader because the control groups also grew at the same rate.

This puts into question the growth of the (NE) control student groups. Was this growth in the control group a true reflection of the traditional paper book system and traditional approaches to reading? The evaluation team believes that the (NE) group was inadvertently influenced to focus on reading and to improve reading performance because they were being monitored. (NE) students were equally asked to maintain student logs, and this activity may have inclined the control group to read more. Also, with the advent of administering reading exams to the (NE) control group, students became highly aware and conscious that their reading scores were being monitored. This may have predisposed teachers and administrators to focus on reading to avoid poor scores. If any of these possibilities were true during the course of the pilot study, then the growth of the control schools would be higher than on average. Thus, the growth of the (E) and (E+OCE) would have been more apparent.

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[13] A detailed explanation on the limitations of these three tests and how the M&E team chose these three tests is provided in Appendix F. Additionally, demographic information on student test takers is included in Appendix G.

[14] The evaluation team conducted tests of statistical significance to determine if the growth in scores was statistically significant. Appendix H provides further detail.

Table 7.0 – Change in Standardized Test Scores from Baseline to Final (Only Students Who Took All Three Exams[15])

		(NE) Group				(E) Group				(E+OCE) Group			
		Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)
P	Avg. Raw Score	17.3/ 68	19.7/ 56	23.5/ 70		25.7/ 68	25.1/ 56	35.5/ 70		19/ 68	25.9/ 56	30.5/ 70	
	Avg. % score	25.5%	35.2%	33.6%	+8.1%	37.8%	44.7%	50.7%	+12.9%	27.9%	46.2%	43.6%	+15.7%
JHS	Avg. Raw Score	16.4/ 82	19.3/ 100	21.1/ 99		18.6/ 82	19.8/ 100	27.6/ 99		20.5/ 82	22.2/ 100	23.6/ 99	
	Avg. % score	19.9%	19.3%	21.3%	+1.3%*	22.7%	19.8%	27.9%	+5.2%*	25.0%	22.2%	23.8%	-1.2%*
SHS	Avg. Raw Score	33.6/ 134	46.6/ 134	63.3/ 135		34.3/ 134	41.8/ 134	57.4/ 135		40.9/ 134	53.4/ 134	67/ 135	
	Avg. % score	25.1%	34.8%	46.9%	+21.8%	25.6%	31.2%	42.6%	+17.0%	30.5%	39.9%	49.7%	+19.1%

(n=309)

Also, several factors may have limited the benefits of the e-reader and thereby affected (E) and (E+OCE) student performance on the exams, namely:

- Late e-reader access and introduction of e-readers near exam time
- Disruptions caused by teacher strikes
- Challenges at the (E+OCE) JHS, including weeding during school hours and the school's week-long closing to provide a public educational examination center
- Challenges at the (E+OCE) SHS, including delayed decision making in splitting students into streams, lack of e-reader use in English class, and reduced access to e-readers outside of school due to bullying
- Late start of OCE activities and limited OCE volunteers from May-July
- High e-reader breakage rates, thus affecting one-on-one time with the device

Within the primary school reading exam, there were subtopics where some students saw more improvement than others subtopics. The majority of (E+OCE) students saw improvement in writing and grammar, while the (E) group saw improvement in writing alone. Taking this data

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[15] A table showing change in standardized test scores for all students, regardless of whether or not they took all exams, is found in Appendix I.

*It is important to note that the standardized test for the JHS level was different at the baseline but similar for the midterm and the final. Therefore the negative growth performance from baseline is more likely to be a reflection of the test as opposed to a real decline in skills.

into consideration, these results may establish that OCE activities heavily influenced grammar skills within the (E+OCE) student group.

Table 8.0 – Primary Level: Change in Standardized Test Scores from Baseline to Final (Only Students Who Took All Three Exams)

		(NE) Group				(E) Group				(E+OCE) Group			
		Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)
Total Score	Avg. Raw Score	17.3/ 68	19.7/ 56	23.5/ 70		25.7/ 68	25.1/ 56	35.5/ 70		19/ 68	25.9/ 56	30.5/ 70	
	Avg. % score	25.5%	35.2%	33.6%	+8.1%	37.8%	44.7%	50.7%	+12.9%	27.9%	46.2%	43.6%	+15.7%
Listening	Avg. Raw Score	3.1/ 10	3.1/ 10	4.5/ 10		3.9/ 10	3.8/ 10	4.6/ 10		3.7/ 10	4.2/ 10	4.3/ 10	
	Avg. % score	30.7%	31.1%	45.4%	+14.6%	38.5%	37.5%	46.0%	+7.5%	36.7%	42.2%	42.6%	+5.9%
Reading	Avg. Raw Score	0.9/ 3	2.4/ 6	1.7/ 6		1.6/ 3	3.1/ 6	2.7/ 6		1/ 3	2.8/6	2.2/ 6	
	Avg. % score	28.6%	39.9%	28.0%	-0.6%	51.7%	50.8%	45.0%	-6.7%	96.3%	46.3%	36.4%	-59.9%
Grammar	Avg. Raw Score	12.3/ 33	12.3/ 33	14.4/ 45		18.7/ 33	16.8/ 33	24/ 45		13.2/ 45	16.9/ 33	20.5/ 45	
	Avg. % score	37.2%	37.2%	32.1%	-5.2%	56.7%	50.8%	53.3%	-3.3%	29.4%	51.1%	45.6%	+16.2%
Writing	Avg. Raw Score	1.1/ 5	0.5/ 5	2.0/ 7		1.6/ 6	0.7/ 5	3.3/ 7		1.1/ 6	0.9/ 5	2.6/ 7	
	Avg. % score	22.1%	9.3%	28.1%	+5.9%	26.7%	13.0%	46.4%	+19.8%	19.1%	17.8%	36.5%	+17.4%
Vocabulary	Avg. Raw Score	N/A	0.8/ 2	0.9/ 2			0.9/ 2	1/ 2			1.1/ 2	1/ 2	
	Avg. % score	N/A	41.1%	44.6%	+3.5%		42.5%	47.5%	+5%		57.4%	50.0%	-7.4%

Growth at the (NE) JHS and (E+OCE) JHS was not statistically significant. Only the (E) JHS group demonstrated statistically significant growth, at +5.2%. It may still be important, however, to appreciate reading growth within the separate experimental groups. There is an obvious trend of growth within the reading comprehension sections of the (E) and (E+OCE) groups, where students experienced a growth in scores of +19.4% and+16.8% respectively. However, these findings do not support that OCE activities had an impact at the JHS level because growth was higher within the (E) group.

Table 9.0 – JHS Level: Change in Standardized Test Scores from Baseline to Final (Only Students Who Took All Three Exams)

		(NE) Group				(E) Group				(E+OCE) Group			
		Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)
Total Score	Avg. Raw Score	16.4/82	19.3/100	21.1/99		18.6/82	19.8/100	27.6/99		20.5/82	22.2/100	23.6/99	
	Avg. % score	19.9%	19.3%	21.3%	+1.3%	22.7%	19.8%	27.9%	+5.2%	25.0%	22.2%	23.8%	-1.2%
Grammar	Avg. Raw Score	3.5/15	4.6/15	4.1/14		4.6/15	4.4/15	4.2/14		4.8/15	4.6/15	4.5/14	
	Avg. % score	23.1%	31.0%	29.0%	+5.9%	30.4%	29.6%	30.2%	-0.2%	31.9%	30.9%	32.0%	+0.1%
Vocabulary	Avg. Raw Score	4.8/17	4.2/15	3.6/15		4.6/17	3.2/15	4.3/15		5/17	3.5/15	4.3/15	
	Avg. % score	28.4%	28.2%	23.8%	-4.6%	26.8%	21.5%	28.9%	+2.1%	29.4%	23.6%	28.5%	-0.9%
Literature	Avg. Raw Score	2.7/8				2.1/8				2.4/8			
	Avg. % score	33.8%				26.4%				30.4%			
Essay	Avg. Raw Score	3.1/30	7.1/60	10.4/60		4.8/30	8.6/60	14.9/60		5.5/30	10.8/60	12.8/60	
	Avg. % score	10.2%	11.9%	17.4%	+7.2%	15.8%	14.4%	24.9%	+9.0%	18.5%	18.1%	21.3%	+2.8%
Reading	Avg. Raw Score	2.3/10	3.3/10	3.5/10		2.6/12	3.5/10	4.1/10		2.7/12	3.2/10	3.9/10	
	Avg. % score	22.9%	32.9%	34.7%	+11.8%	22.0%	35.3%	41.4%	+19.4%	22.6%	32.1%	39.4%	+16.8%

(n=75)

At the SHS level, no clear or obvious trends could be established. Results were sporadic and did not suggest strong trends in growth in reading scores as result of the e-reader. At the sub-topic level, however, (E) and (E+OCE) students experienced growth in the essay writing section at a higher level than the control group, where the (NE) group scored +5.3%, (E) +13.5%, and (E+OCE) +20.8%. This data suggests that the OCE activities may have had some level of impact on essay writing skills.

Table 10.0 – SHS Level: Change in Standardized Test Scores from Baseline to Final (Only Students Who Took All Three Exams)

		(NE) Group				(E) Group				(E+OCE) Group			
		Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)
Total Score	Avg. Raw Score	33.6/ 134	46.6/ 134	63.3/ 135		34.3/ 134	41.8/ 134	57.4/ 135		40.9/ 134	53.4/ 134	67/ 135	
	Avg. % score	25.1%	34.8%	46.9%	+21.8%	25.6%	31.2%	42.6%	+17.0%	30.5%	39.9%	49.7%	+19.1%
Vocabulary	Avg. Raw Score	10.6/ 37	12.4/ 36	22.5/ 50		10.8/ 37	11.2/ 36	18.9/ 50		11.8/ 37	12.9/ 36	21.7/ 50	
	Avg. % score	28.6%	34.5%	44.9%	+16.3%	29.1%	31.2%	37.8%	+8.6%	31.8%	35.9%	43.4%	+11.6%
Grammar	Avg. Raw Score	5/ 21	11.2/ 22	9.3/ 19		3.4/ 21	10/ 22	8.4/ 19		6.9/ 21	11/ 22	8.8/ 19	
	Avg. % score	24.0%	51.0%	48.9%	+24.9%	16.0%	45.6%	44.2%	+28.2%	32.9%	49.9%	46.5%	+13.6%
Diction	Avg. Raw Score	1.3/ 10	5.1/ 10	N/A		0.4/ 10	4.2/ 10	N/A		1.5/ 10	4.8/ 10	N/A	
	Avg. % score	12.6%	50.6%	N/A		4.3%	41.8%	N/A		15.1%	48.3%	N/A	
Essay	Avg. Raw Score	14.1/ 30	11.2/ 30	15.7/ 30		12.5/ 30	10.9/ 30	16.6/ 30		13.4/ 30	13.8/ 30	19.7/ 30	
	Avg. % score	47.0%	37.3%	52.3%	+5.3%	41.8%	36.3%	55.2%	+13.5%	44.8%	46.1%	65.6%	+20.8%
Reading	Avg. Raw Score	2.7/ 36	6.7/ 36	15.9/36		7.2/ 36	5.4/ 36	13.6/ 36		7.3/ 36	10.9/ 36	16.8/ 36	
	Avg. % score	7.5%	18.5%	44.2%	+36.6%	19.9%	15.1%	37.8%	+17.9%	20.3%	30.1%	46.7%	+26.4%

(n=128)

TEACHER PERSPECTIVES ON READING PERFORMANCE

Teachers observed students' reading competency through conversations with students, having them read aloud, student note-taking, verbal and written classroom exercises, homework assignments, essays, and exams. Teachers compared e-reader students' reading competency with non-e-reader students' reading competency, and noted students' improvement over the course of the project. These observations led teachers to conclude that the e-reader has helped students improve their English reading, writing, listening and speaking skills.

Teachers report that students perform better on reading comprehension assignments and exercises than they did previously. Students also read more fluently when reading aloud. Additionally, through the e-readers' dictionary capabilities, students have increased their vocabulary and improved their spelling. In terms of writing, students have improved their

sentence constructions, and in terms of listening, students perform better in dictation exercises. Teachers also observed that students express themselves more analytically than before, and that students in debate clubs are presenting better arguments than before. Overall, teachers believe the e-reader has improved students' confidence and academic performance.

Teachers also admit that some students have seen less improvement than others. When asked how they assist weaker students to improve their reading and writing skills, teachers answered that they tried to give those students individual attention to explain lessons at a slower pace. Some teachers asked better performing students to mentor weaker students, and other teachers gave weaker students extra practice through additional assignments. Teachers added that they tried to monitor students as much as possible to identify struggling students, and that they encouraged students to ask for help when they were having difficulties. Teachers note that helping lower performing students is especially challenging when students have illiterate parents who cannot assist the students at home and who do not emphasize the importance of reading.

4.6 UNANTICIPATED RESULTS

The iREAD Pilot Study set out to test a set of hypotheses, but also carefully observed the positive and negative unanticipated results of e-reader distribution, which are delineated below.

Positive:
    + Students shared the benefits of the e-reader with family and friends.
    + Students and teachers learned to navigate e-reader technology very quickly.
    + E-reader loss and theft were dramatically lower than anticipated.
    + E-readers increased exposure of Ghanaian authors.

Negative:
-Students at the JHS and SHS levels did not experience gains in standardized test scores.
    -E-reader breakages were much higher than anticipated.
    -Certain e-reader functions caused frustration, such as accidental book deletion and improper use of music and internet during class time.

Positive:

+ Students shared the benefits of the e-reader with family and friends.

All students in focus groups reported that they shared their e-readers with friends or family. Through individual student questionnaires, 46% of (E) students and 27% of (E+OCE) students reported sharing their e-readers with friends and family "often" or "very often." Since the baseline evaluation found that study participants have an average of five siblings, the e-reader's reach potentially extended to many people beyond the device's student owner.

+ Students and teachers learned to navigate e-reader technology very quickly.

Interviews and focus group discussions revealed that students and teachers adapted to e-reader technology with ease. Even though many students were not familiar with computers, they quickly explored internet and multimedia features of the devices that were not taught in formal e-reader training sessions. The high number of non-iREAD students attending iREAD Vacation School and frequent use of e-readers by students' family and friends further demonstrate that people with no formal e-reader training can easily learn to use of the devices.

+ Challenges with e-reader loss and theft were less than anticipated.

Theft and loss were kept to minimal levels due to community events, the involvement of community leaders, and a community pledge. Thus, rates of theft and loss were less than 1%.
Over the entire course of the study, only two e-readers had gone missing, and one case of e-reader theft was reported to the police after a thief broke into a student's room and stole the e-reader along with other valuables. It is possible that in the future, when the iREAD project is scaled up and e-readers are used in less tight-knit communities, theft and loss may become larger issues than they were in this pilot study.

+ E-readers have increased exposure of Ghanaian authors.

Worldreader is committed to digitizing local Ghanaian books, believing that students will learn to appreciate reading when they have books that relate to their own culture and surroundings. Worldreader digitized books from several Ghanaian publishers. Worldreader's Ghanaian and West African Publishing Partners are as follows:

- Sub-Saharan Publishers
- Regener8

- Smartline Publishing Ltd.
- EPP Books Services Ltd.
- Sam Woode Ltd.
- Woeli Publishing Ltd.
- Afram Publications Ltd.
- Evans Brothers Ltd.
- Adwinsa Publications Ltd.
- Sedco-Longman Publishing Ltd.

The Ghanaian books that Worldreader has digitized are available online at Amazon's Kindle Store, providing Ghanaian authors with an international reach. In total, Worldreader has digitized 82 Ghanaian books.

Negative:

- Students at the JHS and SHS levels did not experience gains in standardized test scores.

As described above in "Standardized Testing," JHS and SHS students in the (E) and (E+OCE) groups did not perform significantly better than their (NE) counterparts on standardized tests. One possible explanation is that JHS and SHS are more interested in completing the reading required for their core curriculum than they are in reading for pleasure, or that they have more family obligations preventing them from enjoying sufficient leisure reading. Additionally, the fact that SHS students are required to purchase textbooks means that they already possess certain books that they can read at home. It is also important to note that educational researchers agree that reading performance improves slowly over time. It may be unrealistic to expect dramatic increases in reading scores after only 7 months of e-reader exposure.

- E-reader breakages were much higher than anticipated.

Over the course of the study, a total of 243 e-readers were reported broken, indicating a 40.5% breakage rate. A breakage is considered damage or malfunction that cannot be repaired on-site. This high rate of damage limits the cost effectiveness of the e-reader and disrupts student learning during the period of e-reader replacement. In March, Worldreader established a stock of extra e-readers so that when e-readers broke, the students could use replacement e-readers while the broken device was being repaired. However, solutions that directly address the primary causes of breakages are necessary for the long-term sustainability of the project. Worldreader and Amazon have identified the fragile e-reader screen as the major weakness of the device, and are in the process of piloting modified devices with reinforced screens.

- Certain e-reader functions caused frustration, such as accidental book deletion and improper use of music and internet during class time.

The most common complaint that teachers shared during interviews and focus group discussions was that music, games, and the internet distracted students from the educational aspects of the e-readers. Many teachers recommended that the program develop a way to completely eliminate the e-reader's music, game, and internet functionality, while other teachers admitted that students should continue to access internet so long as internet access was censored and controlled. Another negative effect of the e-reader's entertainment aspects was that they attracted bullies who may not have had an interest in the e-reader's educational functions but were jealous of its music, games, and internet capabilities. Bullying was especially prominent at the (E+OCE) SHS. Finally, accidental book deletion was a common problem that

prevented students from having the full set of iREAD books. In October 2011, Amazon rolled out software to limit e-reader functions.

4.7 FACTORS AFFECTING SUSTAINABILITY

At this time, the primary factor limiting the e-reader's sustainability is the high device breakage rate, as 40.5% of e-readers experienced major damage within the 7-month period of the pilot study. However, should technical improvements to the device reduce the breakage rate to minimal levels, the e-reader could be an efficient method to distribute textbooks and educational material.

Table 11.0 estimates that for the years 2014–2018, using a calculation focused strictly on the provisioning of textbooks, **the e-reader system would cost only $8.93-$11.40 more per student over a four-year period than the traditional paper book system**.[16]

This estimate makes two major assumptions:

1. By the year 2014, technical improvements to the e-reader would reduce the device breakage rate to minimal levels, so that the device would last for at least four years. In October 2011, the first shipment of e-readers with strengthened screens arrived in Ghana for pilot testing. It is reasonable to assume that three years of continued collaboration with e-reader manufacturers would yield sufficiently rugged devices.

2. By the year 2014, e-readers would cost $40 at bulk discount. This estimate is realistic considering that as of November 2011, the retail price of e-readers was $79. The cost of the device is continuing to decline, and increased ruggedization of the device should not affect this trend in price.

Additionally, Table 11.0 estimates that e-book prices would be approximately 40% of paper book prices. Worldreader's discussions with publishers suggest that paper books priced at 5-6 Ghana Cedis (GH¢) or ($2.75 - $3.30) could cost 1-2 GH¢ or ($0.55 to $1.10) in digital form. These prices would be sustainable because publishers estimate that even if they sell e-books at significantly lower prices, they would still make greater profits selling e-books than selling paper books. Digital publishing reduces transportation costs, storage costs, paper/ink costs, and risks associated with paper publishing. Additionally, e-books would be more profitable than paper books because they would provide publishers with access to wider markets inside and outside of Ghana. Furthermore, publishers are attracted to digital publishing because it would allow them to trial new books digitally before taking the risk of investing in paper, ink, and storage to print paper books that might not sell successfully.

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[16] It is important to note that estimates do not take into account other benefits, such as the value of supplementary materials. Also, the benefits provided by the e-readers listed in Table 12.0 exceed $11.40USD or more.

Table 11.0 – Cost Comparison Between the Paper System and E-Reader System for the Years 2014–2018

		Avg. Price per Textbook (USD)*	No. of Textbooks per Year for One Student	No. of Years **	Total Cost of Books (USD)	Cost of One E-Reader Device (USD)	Cost of E-Reader Accessories, Set-Up, Training, and Support (USD)	Total Cost over 4 Years (USD)	Cost Difference Between E-Reader and Paper Systems Over 4 Years (USD)
Primary	Paper System	$2.25	9	4	$81.00	N/A	N/A	**$81.00**	
Primary	E-Reader System	$0.90	9	4	$32.40	$40.00	$20.00	**$102.40**	**$11.40**
JHS	Paper System	$2.07	10	4	$82.80	N/A	N/A	**$82.80**	
JHS	E-Reader System	$0.83	10	4	$33.12	$40.00	$20.00	**$103.12**	**$10.32**
SHS	Paper System	$2.66	8	4	$85.12	N/A	N/A	**$85.12**	
SHS	E-Reader System	$1.06	8	4	$34.05	$40.00	$20.00	**$104.05**	**$8.93**

*For the paper system, average price per textbook figures are the price paid by the Ghana Education Service to both print and distribute books for the districts in which project-affected schools are located. For the e-reader system, average price per textbook figures are estimated at 40% of the paper book price. E-books are cheaper than paper books because they eliminate costs related to distribution, paper, and ink.

**This analysis uses four years, assuming that e-readers and paper textbooks could be reused approximately every four years before becoming damaged or outdated. However, there are only three primary years that use English as the language of instruction (primary 4-6), three JHS years, and three SHS years. Therefore, individual students would only use paper books or e-readers for three years at each level.

Currently, the government pays a subsidy of $81.00-$85.12USD per student for paper-based textbooks. In the electronic system of e-readers and e-books, families would only need to pay an additional cost of $8.93-$11.40 per student for four years, which is equivalent to $0.19-$0.24 per month for the same time period. A sustainable option could be for the government to implement a monthly financing scheme so that low income families would be capable of affording e-readers.

At $8.93-$11.40USD more per student over a four-year period than the traditional paper book system, the e-reader offers benefits over the traditional paper book system. The current paper system standard is to provide textbooks only. The e-reader not only provides textbooks, t it also provides a substantive amount of supplementary reading materials. Therefore, more topics can be discussed and explored across the school year. Table 12.0 illustrates the value added aspects of the e-reader.

Table 12.0 – Benefits of Traditional Paper System vs. E-Reader System

Traditional Paper System	E-Reader System
Cost: $81.00-$85.12USD over 4 years	Cost: $102.40-$104.50USD over 4 years
Benefits: • 8-10 traditional textbooks. These books are kept in the classroom for primary and JHS levels. Additionally, traditional textbooks often do not arrive at schools, so that students frequently have to share books.	Benefits: • A wide range of textbooks. In addition to gaining access to 8-10 textbooks required for their current class year, students can also access textbooks from previous years when they need to review material, and access textbooks for future years when they want to learn ahead. • Transparency in ensuring that books actually arrive in students' hands • Exposure to technology, which facilitates practical Information Communication Technology (ICT) skills • Thousands of supplementary books • Newspaper, magazine, and blog subscriptions • Built-in English dictionary • Reading aloud feature • Ability to increase font size for students without glasses • Internet • Educational games • Choice in downloading materials

In conclusion, the e-reader system could be an efficient delivery method for textbooks and educational materials after device breakage rates drop and device costs drop within the technology market. More importantly, the introduction of the e-reader could bridge the digital divide as well as eliminate logistical issues of transporting books by providing students with access to thousands of informational resources.

Analysis of Costs from an Individual Consumer Perspective

The cost analysis provided in Tables 11.0 and 12.0 focuses on cost from a government or donor perspective, in which the government or donors could secure significant bulk discounts. Appendix N, however, provides a cost analysis from the perspective of individual consumers, who would purchase materials at retail prices. This analysis reveals that over three years[17] the e-reader system would be $8.76USD more expensive than the paper system for primary students. At the primary level, consumers would break even on their e-reader purchases after buying four additional books.

At the JHS level however, there would be a cost savings of $43.40USD as opposed to the more expensive paper system that is currently in use. Similarly, there would be a cost savings $65.79 as opposed to the more expensive paper system that is currently in use. Again, these estimates

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[17] The cost analysis from a government/donor perspective uses four years, assuming that e-readers and paper textbooks could be reused approximately four years before becoming damaged or outdated. The individual consumer cost analysis, however, uses three years, since there are only three primary years that use English as the language of instruction (Primary 4-6), three JHS years, and three SHS years. Individual students would only use paper books or e-readers for three years at each level.

are based on calculations strictly focused on the provisioning of textbooks, and do not take supplementary reading materials into account.

The main advantage of the individual consumer cost analysis versus the government/donor cost analysis is that it demonstrates that the more money families spend on books, the more families would save by using the e-reader system, since e-book prices would be approximately 40% of paper book prices. Further iREAD studies would need to investigate families' willingness to pay retail prices for digital reading materials that are beyond free government materials.

5. CONCLUSIONS

As governments, USAID, and other development organizations search for ways to achieve the Millennium Development Goals, the e-reader raises a promising opportunity to make progress toward the second of these stated goals: achieving universal primary education. The e-reader offers immediate access to reading materials that once took months to arrive—and even that arrival was not guaranteed.

The final evaluation revealed that primary among the short-term benefits of the e-reader is that students had immediate and reliable access to books for academic and personal use. In the medium-term, student and teachers had access to reading materials and teaching resources that facilitate and significantly accelerate the learning process, since students were able to have direct access to information in a home setting. In the long-term, final evaluation data strongly suggest that when the device is introduced and managed properly among primary level students, it has the potential to improve reading performance, and more importantly increase enthusiasm for reading as a lifelong habit. In the Ghanaian context, improved literacy helps to address poverty levels of the next generation. Increased skills in literacy, as well as technology, will equip Ghana's next generation with valuable tools for self-sustainability.

Conversely, there were also many challenges to the management of e-readers within the pilot study. Major concerns were that the sample of students was not geographically representative of Ghana. Also, almost half of the e-readers experienced some breakage. Thirdly, time exposure to the tool was greatly reduced due to teacher strikes.

The iREAD Ghana Pilot Study aimed to investigate the effects of introducing e-reader technology in Ghanaian public schools at the primary, junior high school and senior high school levels. More specifically, this study focused on the following questions:

- *Did iREAD interventions affect student access to reading materials?*

   One of the most significant results of the e-reader technology was its dramatic affect on access to a greater number and variety of reading materials. The baseline evaluation found that although libraries provided books for JHS and SHS students, students could only access books on library premises during school hours. While the baseline evaluation found that students had significantly limited access to textbooks and books at home, students with e-readers had an average of 107 books each by the time of the final evaluation. Prior to the introduction of e-reader devices, teachers reported that insufficient numbers of books meant that students had to share available books, where certain subjects did not have any textbooks, and primary and JHS teachers could not assign reading homework to students. With the introduction of the e-reader, students immediately gained access to mandatory materials, as well as a wide selection of books,

magazines, and articles of all genres. The Worldreader initiative was particularly sensitive to the appeal of Ghanaian books, giving students access to culturally familiar reading material in addition to international texts.

- *Did iREAD interventions affect teacher access to educational resources?*

  The final evaluation similarly found that teacher access to educational resources appreciably increased. Teachers who had once been dependent on sparsely available and outdated textbooks could now use previously inaccessible supplementary educational materials, provided by Worldreader. The e-reader allowed teachers to conduct background research, create lesson notes, and design reading comprehension assessments for students. Since their work was made more efficient and easy, teachers reported having more time to enhance the quality of their lessons.

- *Did iREAD interventions affect student attitudes towards reading?*

  Data from the iREAD pilot study indicate that e-reader technology stimulated student enthusiasm about reading and led students to actively seek reading material that interested them. High student-participation rates in voluntary reading activities organized by Worldreader also demonstrated a high level of enthusiasm towards reading. Teachers did note that students whose e-readers broke or froze were less enthusiastic, and that the hassle of charging devices similarly dampened student interest. Despite these setbacks, however, teachers agreed that for the most part, students demonstrated increased levels of excitement around reading.

- *Did iREAD interventions affect teacher and student technological capabilities?*

  The baseline evaluation established that students have limited access to technology outside of the e-reader, with nearly half of participants having never used a computer. The e-reader provided all users with daily exposure to technology, allowing them to develop practical communication technology skills that they may eventually apply to computers. Students indicated that they had no difficulties learning how to access the internet to perform research and discover new reading materials, and they quickly became familiar with multimedia features.

- *Did iREAD interventions have an effect on student reading performance in any meaningful way?*

  Standardized tests results indicate consistent improvement among primary school students who received e-readers, especially those who were also offered OCE activities. No other growth in scores could be attributed to the e-reader since the control group also improved. Had the control group had less influence to read, perhaps the growth in the (E) and (E+OCE) groups would have demonstrated an effect.

The iREAD Pilot Study also examined unanticipated results of the e-reader, both positive and negative. These results are as follows:

Positive:

- *Students shared the benefits of the e-reader with family and friends.*

All students in focus groups reported sharing their e-readers with friends or family, potentially increasing the reach of the e-reader's impact drastically, since study participants have an average of five siblings.

- *Students and teachers learned to navigate e-reader technology very quickly.*

Focus group discussions revealed that students and teachers adapted to e-reader technology with ease and rapidly developed a facility with the devices, including their internet and multimedia features, even though many were not familiar with computers.

- *Challenges with e-reader loss and theft were less than anticipated.*

Efforts to cultivate community ownership of the e-reader technology successfully kept theft and loss to minimal levels, with rates of theft and loss at less than 1%. However, it is possible that this rate would increase if the iREAD project is scaled up and extended to less tight-knit communities.

- *E-readers increased exposure of Ghanaian authors.*

Worldreader made a special effort to digitize local Ghanaian books in order to stimulate student reading with books that capture familiar cultures and surroundings. All 82 Ghanaian books that Worldreader has digitized are available on-line at Amazon's Kindle Store, providing Ghanaian authors with international exposure.

Negative:

- *E-reader breakages were much higher than anticipated.*

Over the course of the study, breakage rates reached 40.5%, reducing both the educational impact and cost effectiveness of the e-reader. The long-term sustainability will hinge on solutions that directly address the primary causes of breakages, such as dust and fragile e-reader screens.

- *Certain e-reader functions, such as accidental book deletion, music, and internet, were problematic.*

Teachers commonly raised their concerns that music, games, and the internet distracted students from the educational aspects of the e-readers, as well as attracting bullies who were likely less interested in the e-reader's educational aspects than in its entertainment capabilities. Accidental book deletion prevented students from having the full set of iREAD books.

At this time, the primary factor limiting the e-reader's sustainability is the high device-breakage rate. However, should technical improvements to the device reduce the breakage rate to minimal levels, and should the cost of the device continue to fall, the e-reader would be an efficient, cost effective method to distribute textbooks and educational material.

Finally, the final evaluation provided insight into questions raised during the mid-term evaluation:

- *What makes OCE activities successful?*

Results from standardized test scores indicated that (E+OCE) primary students performed better than their (E) and (NE) counterparts. (E+OCE) primary students received a total of 10 Saturday OCE sessions, with each session lasting about three hours. Structured OCE activities targeted key language skills such as reading comprehension, vocabulary, grammar, listening, and writing. Outside of academics, volunteers believed that OCE students were exposed to new perspectives through interaction with mentors such as university students. At the same time, OCE program leaders shared that OCE activities boosted student confidence as students taught their mentors how to use the e-readers and realized that they too could be mentors themselves.

- *What kinds of student backgrounds, student behaviors, and other factors are associated with the greatest benefits from the e-reader?*

Results from the pilot study reveal that the e-reader affected reading performance most significantly at the primary level. Therefore, within this study, grade level correlated to the success of the device and served as a principal social factor. Standardized test results also suggest that primary students from non-agricultural backgrounds may have benefitted more from the e-reader than students from agricultural backgrounds. However, this finding requires further investigation and confirmation.

- *Why are some of the scores among certain students not increasing significantly by the end of the project?*

Initially, it was anticipated that reading scores would be the critical indicator of program success. As the project progressed, however, it became clear that growth in reading comprehension was incremental. It may take longer than the estimated 7 months of exposure to appreciate impact in reading performance, especially among older JHS and SHS students who are past the age of reading interventions having the greatest impact. It is possible that improvement in areas such as spelling and reading speed have not yet translated into the essay writing and reading comprehension skills measured by standardized tests. Other students may not have improved in test scores due to e-reader breakages, which reduced exposure to the e-reader and lowered student morale.

- *What books are (NE) students accessing, and how has the presence of the study affected their reading habits?*

In a focus group discussion with (NE) primary students, participants reported having access to 2–7 books at home. At the SHS level, (NE) focus group participants reported having access to around 20 books at home. Similarly, baseline data established that (NE) students had an average of 7.5 books at home. It is unrealistic, therefore, that (NE) students with limited access to books could have actually completed an average of three books per week over the duration of the 31-week reporting period, as was self-reported.

Additionally, the evaluation team believes that the (NE) group was inadvertently influenced to focus on reading and to improve reading performance because they were being monitored. (NE) students were equally asked to maintain student logs, and this activity may have inclined the control group to read more. Also, with the advent of administering reading exams to the (NE) control group, students became highly aware and conscious that their reading scores were being monitored. This may have predisposed teachers and administrators to focus on reading in order to avoid poor scores. If any of these possibilities were true during the course of the pilot study, then

the growth of the control schools would be higher than on average. The M&E team provides recommendations on improving the reliability of self-reported data and limiting the influence of the study on the control group in Section 7's Recommendations.

6. RECOMMENDATIONS

The evaluation team recommends that Worldreader determine whether the effects of the e-reader align with their current agenda and the goals of stakeholders, namely USAID. In early 2011, USAID introduced two major policies/strategies relevant to the iREAD Ghana Study. USAID issued the new Evaluation Policy in January 2011, which called for more rigorous evaluations and methodologies with an emphasis on impact evaluations. Secondly, USAID issued the new Education Strategy 2011–2015 in February 2011 with a focus on primary school-aged children.

Having already started the project in October 2010, the project was not able to fully integrate some of the policies released in 2011. Of primary concern was the need for a more rigorous sampling methodology to be used in the iREAD pilot. Secondly, the new education policy calls for more focus on primary school-aged children, which aligns well with the target intervention groups of primary-aged students in the iREAD study.

The pilot study data establish increased enthusiasm for reading as well as a clear and apparent boost in access to reading materials. At the same time, reading score growth was assumed to be a central indicator of progress, but now serves as a contributing factor uniquely at the primary school level. Additionally, the device is not currently cost effective, but the price of the device continues to decrease in the market.

Overall, it is clear that the e-reader had positive effects on students, teachers, and the holistic classroom experience. The major recommendation is to now determine if these results are replicable in a more genuine random sample that is larger in size and representative of more areas of Ghana. Within this second project, it would be important to address the limitations outlined within the report to reduce any confounding factors that could skew results. This would mean that issues such as equipment-failure, reduced exposure days, and other limitations would need to be addressed.

In the spirit of creating recommendations that are directly relevant, manageable, and doable, the evaluation team proposes 13 specific recommendations across three categories:

1. Methodological/Study Design Recommendations
2. Programmatic Recommendations
3. Technological Recommendations

Methodological/Study Design Recommendations focus on the strengths and weaknesses of the methodology and the design of the pilot study overall. Programmatic recommendations center on ways in which the program could be more effective and ways in which teachers and program implementers could carry out activities differently. Lastly, the technological recommendations focus more on hardware issues related to the device.

Table 13.0 summarizes these recommendations and identifies how each recommendation affects specific stakeholders. These stakeholders include Worldreader, the future evaluation

team, donor partners, government agencies, product manufacturers, microfinance organizations and potential device distributors, publishers, teachers, students, and administrators.

Table 13.0 – Recommendations and Affected Stakeholders

No.	Recommendation	Worldreader	Future Evaluation Team	Donor Partners (ex: USAID)	Government Agencies (ex: MoE/ GES)	Manufacturers (ex: Amazon)	Microfinance Organizations & Potential Device Distributors	Publishers	Teachers/ Administrators/ Students
	Methodological/Study Design Recommendations								
1	Use a genuine random sample for the purposes of drawing conclusions on Ghanaian public schools	✔	✔						
2	Limit influences and exposure within the control group	✔	✔						
3	Modify data collection tools to capture data on student reading habits	✔	✔			✔			
	Programmatic Recommendations								
4	Focus on primary schools and OCE activities to maximize benefits	✔		✔	✔				
5	Pilot potential funding mechanisms to explore sustainability	✔		✔			✔		
6	Gain greater stakeholder buy-in	✔							
7	Integrate e-readers more fully into the entire curriculum	✔			✔			✔	✔
8	Reduce logistical challenges for iREAD 2011-2012	✔							
9	Continue to build the capacity of teachers so that the tool is used to its maximum potential	✔			✔				✔
10	Introduce e-readers to teacher training colleges and teachers' unions	✔			✔				
11	Expand iREAD Activities to underserved areas	✔		✔	✔				
	Technological Recommendations								
12	Reduce the number of e-reader breakages	✔				✔			
13	Develop an improved e-reader management system	✔				✔			

Although Worldreader has started to address many of the above recommendations, the following recommendations could greatly strengthen future programs when fully achieved.

Methodological/Study Design Recommendations

1. Use a Genuine Random Sample for the Purposes of Drawing Conclusions on Ghanaian Public Schools

The M&E team recommends a revised sampling method that uses a larger sample size and smaller confidence interval of +/-2 based upon the current accurate population of school-bound

children across Ghana's 10 regions. A smaller confidence level and a larger sample size would assure stakeholders of the reliability of results, particularly, a larger sample size would ensure that results truly reflect the population. If the general population of the target group is above three million, then the sample size would need to be at least 2,400. Future studies should also randomly select schools from throughout Ghana's 10 regions, and randomly select streams of students.

2. *Limit Influences and Exposure within the Control Group*

It is unsure as to the level of influence that (NE) group activities had on the study. As a first measure, it may prove valuable not to administer tests to the (NE) group, but rather use old exams or quizzes to establish reading levels. This may cause an unequal comparison of scores against the (E) and (E+OCE) groups, but the true reading competency of the (NE) group would reveal itself. Similarly, the (NE) group should not be included in student log exercises, to avoid bringing attention to monitoring activities. It would be up to the discretion of the future evaluation team to include the (NE) group when administering questionnaires, however any and all interaction with the control group could incite the group to want to perform better in reading.

3. *Modify Data Collection Tools to Capture Data on Student Reading Habits*

Self-reported data from student weekly logs during the pilot study was highly unreliable. To improve data on self-reported reading habits, the M&E team recommends that instead of having students fill forms on their own on a weekly basis, the M&E team should administer questionnaires in person on a monthly basis. These questionnaires would be redesigned to focus only on the most relevant questions that solicit reliable, honest responses from students. Additionally, manufacturers could develop an improved device-based monitoring system that systematically tracks the materials that students access in order to eliminate the bias of self-reporting and provide more accurate data on student reading habits. At this time, Amazon provides limited information on the materials that students download. However, there is potential for the device to systematically capture data on the number of pages that students view in each book and the frequency with which students open each book.

Programmatic Recommendations

4. *Focus on Primary Schools and OCE Activities to Maximize Benefits*

Standardized test scores revealed that e-readers enhanced English proficiency at the primary level, while e-readers had minimal effect on reading proficiency at the JHS and SHS levels. Therefore, Worldreader should work with donor partners and the Ghana Education Service (GES) to focus iREAD efforts on primary students who benefit the most from e-readers in terms of improved reading and writing performance.

In focusing solely on primary students, Worldreader should consider the following:

- Digitize additional content that is appropriate for primary students. During the pilot, primary teachers commented that there should be more books at their students' reading levels. Additionally, digitizing local language reading materials for primary 1-3 students would be important, since classes in those grades are conducted in local languages. Primary students might also benefit from basic picture dictionaries geared towards their reading level as well.

- Train primary teachers in classroom management with the e-reader. Teacher interviews revealed that primary teachers had difficulty managing student distractions. One primary teacher specifically commented that it was very time consuming for her to ensure that all her students were on the same page of an e-book, and that sometimes she chose paper materials or other class activities that required less time over the e-reader.
- Work with device manufacturers to cater the e-reader towards primary students. Manufacturers could improve e-reader technology to better display illustrations that appeal to primary students. Additionally, manufacturers could change the text-to-speech function so that it reads with a Ghanaian/British accent and offers a slower speed option.

Primary students who saw the greatest gains in standardized test scores were those students who received OCE interventions. Thus, it is also important to strengthen OCE activities in order to maximize impact. To have a greater influence on students, OCE activities may need to occur more regularly. Although testing the effectiveness of OCE activities after school versus during school hours was outside the scope of the pilot iREAD study, future iREAD activities should draw upon best practices identified by other education initiatives in Ghana and internationally. For example, evaluation results of the national pilot of the Ghana Teacher Community Assistant Initiative (TCAI) will be available in August 2012. Findings from the TCAI evaluation will provide valuable data on whether remedial education interventions are more effective during or after school hours.

Additionally, OCE interventions need to specifically target improvement in key aspects of reading competency in order to achieve specific educational results. Volunteers should be well trained, with specific lesson plans that focus on key language skills such as phonological awareness, word recognition, fluency, and comprehension. To provide individual attention that is often lacking in large class sizes, the program should recruit additional OCE volunteers to create a low volunteer to student ratio. Individual attention is especially important for poor performing students with limited English skills who may not be using the e-reader to its fullest potential. Randomized control trials in Kenya and India indicate that grouping students by their achievement level and enlisting the help of community teaching assistants can be effective in improving primary students' reading performance.[18] Worldreader could consider incorporating these practices by splitting OCE students by reading level and training volunteers from the community.

5. *Pilot Potential Funding Mechanisms to Explore Sustainability*

Even if the price of the e-readers falls, it is unrealistic at this time for the government of Ghana, USAID, or other donor agencies to buy e-readers for all students. Therefore, in order to scale up the project, it would be critical for Worldreader to develop and pilot an effective business model that takes advantage of a strong private/public partnership mixed with subsidies from low-income families.

In a parental contribution model, the government and/or donor agencies could subsidize e-readers, and families could cover remaining costs through affordable payment installments. This would allow families to bear some of the costs and also assign a value to the device within the home setting. A pilot of the parental contribution model would be critical in understanding if

[18] Banerjee, A., S. Cole, E. Duflo and L. Linden (2005). "Remedying Education: Evidence from Two Randomized Experiments in India". 2005; Banerji, R.; A. Banerjee, E. Duflo, R. Glennerster and S. Khemani (2009). "Pitfalls of Participatory Programs: Evidence from a Randomized Evaluation in Education in India."; Dupas, P., E. Duflo and M. Kremer (2009) "Peer Effects and the Impact of Tracking."

there is an e-reader market for students at primary, JHS, and SHS levels. Similarly, the pilot would measure families' interest in purchasing supplementary reading materials beyond free government textbooks when books are at significantly reduced digital prices. Additionally, a pilot of the parental contribution model could document how device use among families that pay for the device differs from device use among families that receive the device for free.

In a scaled-up parental contribution model, private stakeholders, such as mobile carriers and device manufacturers, could sell and distribute e-readers. At this time, Worldreader is in preliminary discussions with various microfinance organizations as well as credit facilitators within mobile carrier companies. These private stakeholders would risk losing money if parents default on payment installments, break the devices, discover that demand for e-readers is less than anticipated, or any other unexpected challenges arise. In order to reduce such risk during the experimental phases of the project so that private stakeholders are more willing to be involved, donors could explore the possibility of providing bank guarantees to mitigate potential losses.

6. Gain Greater Stakeholder Buy-In

In order to continue and scale-up iREAD activities, it will be necessary for Worldreader to gain greater buy-in from stakeholders such as donor partners and the Ghana Ministry of Education. At this time, stakeholders' greatest concerns are that the cost of the device does not justify the benefits, as improvements to the paper book system could potentially achieve similar benefits in a more cost-effective manner. In order to address these concerns, Worldreader will need to draw clear comparisons that demonstrate the costs and benefits of the e-reader system versus the traditional paper book system so that stakeholders can more clearly appreciate the value-added aspects of the device.

7. Integrate E-Readers More Fully into the Curriculum

USAID's and GES' primary interest in the e-reader is its potential to efficiently deliver textbooks. In order to realize this potential, Worldreader will need to work with publishers and GES to digitize additional textbooks so that the e-reader covers as many class subjects as possible.

Teacher interviews also reveal that some textbooks currently on the e-reader do not cover the syllabus adequately, limiting the e-reader's use in the classroom. A teacher review committee could potentially identify the books that teachers find most useful.

8. Reduce Logistical Challenges for iREAD 2011-2012

As a pilot program, the iREAD 2010-2011 program faced logistical difficulties that limited the study's ability to appreciate the full impact of the e-reader. In expanding the study to the 2011-2012 school year, Worldreader has the opportunity to address logistical difficulties that negatively affected students' abilities to utilize the e-reader. iREAD 2011-2012 should begin promptly at the start of the school year, so that students can use e-readers for a full 11 months.

One major logistical challenge during the pilot was that students did not have clip-on lights specific to their e-readers until the fifth month of the program. As a result, students with limited access to electricity had difficulty reading in the evening for the majority of the program. The iREAD 2011-2012 program could provide clip-on e-reader lights the start of the school year.

Another logistical challenge during the pilot related to charging the e-readers. Devices need to be charged frequently, and sometimes lessons delayed because teachers had to wait for students to charge their devices before beginning. Since there were not enough chargers for

each student to take home, students had to charge at the school, which was time consuming for teachers and inconvenient during vacation when students were not in school. One teacher who served as a project coordinator observed that he spent an average 40 minutes every school day charging students' e-readers. For iREAD 2011-2012, Worldreader could provide individual chargers so that students can charge e-readers on their own rather than depend on teachers or class prefects. Worldreader is in the process of testing micro-solar chargers for students to use.

9. Continue to Build the Capacity of Teachers so that the Tool is Used to its Maximum Potential

As a preliminary step in the process of strengthening the capacity of teachers, we recommend that teachers undergo additional training on 'methodologies to teach reading to children'. Having a stronger mastery of this basic principle would give teachers more confidence to use an electronic tool with a similar purpose.

Teachers could also benefit from additional training on incorporating e-readers into the curriculum and the classroom. Across Nov–Dec 2010, Worldreader organized training for teachers that covered topics such as lesson planning, identifying aspects of the syllabus that could benefit from use of the e-reader, and developing specific teaching methods. Through teacher weekly logs, teachers indicated that they practiced the skills they learned in training. However, when teachers described their typical lesson plans during mid-term and final evaluation interviews, the majority of teachers indicated that they and their students generally read aloud together as a class from the e-reader. While reading aloud does improve reading, teachers de-emphasized other effective literacy techniques such as phonics, syllabics, comprehension strategies, responding to texts, small-group activities, etc. Additionally, teacher interviews revealed that a number of teachers did not utilize the e-reader for homework.

In order to ensure that teachers maximize e-reader impact by implementing a range of evidence-based teaching methods, Worldreader could provide additional teacher training and establish a system in which teachers regularly reflect on challenges and best practices related not only to the technological aspects of the e-reader but also to literacy instruction. Education specialists from Worldreader and the Ghanaian Ministry of Education could facilitate workshops during which teachers describe the successes and shortcomings of various approaches, lesson plans, and curricula in order to collaboratively formulate solutions to commonly encountered problems. Education specialists could continually follow-up with teachers so that teachers have the support they need to achieve high educational outcomes with e-readers.

10. Introduce E-Readers to Teacher Training Colleges and Teachers' Unions

Since teachers use e-readers with students on a daily basis in the classroom, the success of the iREAD project hinges on teacher buy-in. Worldreader should consider piloting interventions targeting teacher training colleges and teachers' unions. By introducing e-readers to teachers in these venues, teachers could become more familiar with the device, design activities and strategies using the device, and provide key input on adapting the device to the classroom. Additionally, GES could remotely provide ongoing in-service training and support to teachers through e-readers.

11. Expand iREAD Activities to Underserved Areas

For logistical purposes, the pilot iREAD Ghana Study took place in the Eastern Region of Ghana, within a three-hour driving distance from Accra. In the Eastern Region, the youth literacy rate for persons aged 15-24 is 72.8%. However, the areas of Ghana with the lowest literacy rates are

the three Northern regions, where the youth literacy rate is 35.7% in the Northern Region, 45.0% in the Upper East Region, and 46.2% in the Upper West Region.[19] In order to target particularly deprived populations of students, future iREAD activities should involve students from the Northern regions of Ghana.

Technological Recommendations

12. Reduce the Number of E-Reader Breakages

Over the course of the study, a total of 243 e-readers were reported as broken, indicating a 40.5% breakage rate. This high rate of damage limits the sustainability of the e-reader and disrupts student learning during the period e-reader replacement. Worldreader should work with e-reader manufacturers to develop more protective, dust-resistant e-reader cases and more durable e-reader screens that can withstand heavy use by students in a rural, tropical context

If after these adjustments are made and there are still breakages, stakeholders have started to discuss a system of accountability in which students who damage or lose e-readers may potentially have to pay a replacement fee. Another possibility is that the program could provide resources and training to local businesses to repair broken e-readers so that e-readers do not need to be transported overseas for repair.

13. Develop an Improved E-Reader Management System

Worldreader should work with manufacturers to design an e-reader management system that can control and monitor large numbers of e-readers on one account so that, for example, all primary students could be connected to one single account. In the current system, only five e-readers can be connected to one account, making it difficult to ensure that each student has the same set of books and to document the materials that students have downloaded themselves. An improved monitoring system could also assist the iREAD team in systematically monitoring the materials that students access, which is important considering the high unreliability of student self-reported reading. Finally, an improved, centralized management system could also help to control students' ability to use the music and internet functions on their e-readers, which teachers find problematic. At this time, Worldreader is in close dialogue with Amazon and third-party developers to improve the e-reader system. In October 2011, Amazon will roll out software to limit problematic e-reader functions.

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[19] Ghana Statistical Service, 2003 Core Welfare Indicators Questionnaire Survey

APPENDIX A – DETAILS ON OCE ACTIVITIES

The table below outlines OCE activities over the course of the pilot study.

Dates of OCE Activities

Dates	Activities
December 11	Lincoln Community School Mentoring (JHS)
February 5	Ashesi University Student Mentoring (SHS)
February 12	Ashesi University Student Mentoring (SHS)
February 19	Lincoln Community School Mentoring (Primary & JHS) Writer's Project of Ghana Workshop (SHS) Ashesi University Student Mentoring (SHS)
February 26	Ashesi University Student Mentoring (SHS)
March 26	Ashesi University Student Mentoring (SHS)
2 April	Ashesi University Student Mentoring (Primary, JHS, SHS)
May 7	Reading Contests (Primary, JHS, SHS)
May 14	Reading Contests (Primary, JHS, SHS)
May 28	Reading Contests (Primary, JHS, SHS)
June 4	Lecture and Exercises on Listening Skills (Primary, JHS, SHS)
June 18	Lecture on Pursuing One's Dreams (Primary, JHS, SHS)
June 25	Writer's Project of Ghana Workshop (Primary) Reading Contests (JHS & SHS)
July 9	Self Educate Workshop on Reading and Writing (Primary, JHS, SHS)
July 16	Self Educate & Project Coordinator Lecture on Exam-Taking Skills (Primary, JHS, SHS)

All of the volunteers were recruited by the project coordinator, an education professional. They received support from the project coordinator but they developed some independence as they gained familiarity with e-readers and students.

The OCE extracurricular enrichment activities were purely voluntary for students, and not all students in the (E+OCE) group attended. Teachers also did not attend. According to a Worldreader estimate, about 15-20 primary students, 17-20 JHS students, and 20-30 SHS students were usually in attendance at the sessions, which lasted from 9am until 12pm on Saturdays. The Worldreader Ghana operations manager estimated that somewhat more than half of the students in each grade attended sessions on a regular basis; other students came only on some Saturdays. The table below outlines students' self-reported attendance rate, indicating that about a third of primary and JHS students attended often or very often, and that over half of SHS students attended often or very often.

Self-Reported Frequency of Attending OCE Activities among E+OCE Students

	Never	Sometimes	Often	Very Often
Primary	0.0%	57.1%	7.1%	28.6%
JHS	7.1%	50.0%	5.4%	28.6%
SHS	10.3%	23.1%	17.9%	43.6%

(n=127)

Overall, volunteers praised the iREAD program for increasing students' interest in reading and education, improving English language skills, improving technological skills, providing students with an opportunity to access large numbers of books, and motivating teachers. Their praise was based on interaction with the limited number of students who attended OCE activities

Volunteers shared that on an academic level, OCE activities benefited students by improving their reading comprehension, vocabulary, grammar, and writing skills. Outside of academics, volunteers believed that iREAD study participants were exposed to new perspectives by

interacting with university students as well as published Ghanaian literary writers. At the same time, OCE program leaders believed that OCE activities boosted student confidence as students taught their mentors how to use the e-readers and realized that they could be mentors as well. Most volunteers agreed that (E+OCE) students enjoyed OCE activities and were eager for volunteers to return. One volunteer observed that Ghanaian classrooms often focus on rote memorization, and he hoped that through OCE activities, students would explore texts beyond surface details.

Sample OCE lesson plans are found below.

Teaching and Learning Objectives for Primary 4 (P4)
Saturday 19.2.11

Word / Sentence Level:

- To define an adverb
- To identify adverbs in text
- To use adverbs effectively in written and spoken work
- To recognise the tense in sentences that include adverbs
- To change the tense of such sentences e.g. from past tense to present tense

Text Level:

- To be able to identify and answer a literal question; i.e. a question which requires literal information to be taken straight from the text
- To identify and answer an inferential question; i.e. a question which requires clues to be taken from the text to give an answer
- To identify and answer a deductive question; i.e. a question requiring the identification of clues and personal experience to draw a conclusion
- To be able to identify and answer an evaluative question; i.e. a question requiring the selection of information from the text to form a judgement.

Team work objectives:

- To nurture speaking and listening skills by:
- Encouraging all children to contribute towards group discussions
- Encouraging children to take on a leadership role within the group when appropriate
- To support weaker students in being able to contribute effectively
- Ensuring that all group members contribute towards creating a comfortable environment in which all students feel confident to participate
- Encouraging children to reach the directed conclusion within the allotted time given
- Supporting children in time management skills generally

Lesson Plan – Saturday 19.2.11

Sentence/ Word Level Work: Adverbs

Resources: e.reader book – **To Catch a Monkey (Chap.1 'Dr Osei's Visit) by Kofi O. Okyere** and notepaper for each group

Duration; Approximately 15-20 mins
(before a full reading of chapter 1,)

- Discuss what an adverb is and its purpose within a sentence
- Each student then to identify and note down a sentence that includes an adverb or adverb phrase from any part of the first chapter.
- Each student to note what tense their sentence is written in and write down the same sentence in a new tense; e.g. past to; present or future tense
- Group leader to ensure that each students completes the task accurately
- Groups break after 20 minutes to report their findings to whole class

Text level work: Comprehension

Duration; Approximately 1 hour
Resources; e.reader and one large piece of poster sized paper (preferably!). A marker

- Discuss as a whole class the 4 main question types that may feature in comprehension exercises (on teaching and learning objectives page)
- Explain that each group is to quickly choose a student leader to act as spokesperson for the group when task is completed
- Explain that the exercise hopes to identify a group which gets the most questions correct
- Student groups then do shared reading of Chapter 1.
- As a group children identify each question type, e.g. Inferential of literal as well as an agreed answer.
- An elected member then scribes each answer on poster paper
- Groups then proof read their answers on completing all 10 questions
- At the end of allotted time each group reports answers back to whole class through their elected spokesperson
- Volunteer to help to decide which group wins
- E.Reader Location numbers are given at the end of some question to help students find answers
- Primary students to be given more support than JHS students

Comprehension Questions –Primary/ JHS

1. What was the name of the doctor in chapter 1. of the story 'To Catch a Monkey' ?
(1 mark)

2. What time of day is it when the story begins? (Loc.35-38)
(1 mark)

3. Find 3 phrases between locations 35 - 40 that indicate that the author has used a beach setting in this chapter.   (3 marks)

4. What day of the week does Coconut run errands for his mother?
(Loc. 39 - 40)   (1 mark)

5. Why do you think the women salted some of the fish before taking it to market? (Loc. 40- 43)   (2 marks)

6. In your own words, what to you think the phrase 'hustle and bustle' means? (Loc. 43 – 46)   (2 marks)

7. (a) Do you think Coconut likes Sister Mama?   (1 mark)
    (b) In your own words using evidence from the text, explain why you
      think this. (Loc.49 – 52)   (2 marks)

8. How much money did Coconut receive for delivering foodstuffs to Sister Mama? (1 mark)

9. (a) What does the phrase; ' Coconut's heart sank' mean? (loc. 64 – 67)
      (2 marks)

    (b) Why do you think Coconut's heart sank when he saw Dr. Osei turn off the main road? (Loc.64 -67)   (2 marks)

10. At the end of the chapter, the author writes; 'Coconut left for his secret place'.
    Use evidence from the text to explain in detail, why you think Coconut did this.
    (4 marks)

Teaching and Learning Objectives for S.S.S.
Saturday 19.2.11

Word / Sentence Level: Body Language Clues in Text:

- To understand that body language is a form of communication
- To identify body language clues in text
- To be able to use such clues to convey meaning
- To understand that not all communication is verbal

Text Level:

- To be able to identify and answer a literal question; i.e. a question which requires literal information to be taken straight from the text
- To identify and answer an inferential question; i.e. a question which requires clues to be taken from the text to give an answer
- To identify and answer a deductive question; i.e. a question requiring the identification of clues and personal experience to draw a conclusion
- To be able to identify and answer an evaluative question; i.e. a question requiring the selection of information from the text to form a judgement.

Team work objectives:

- To nurture speaking and listening skills by:
- Encouraging all children to contribute towards group discussions
- Encouraging children to take on a leadership role within the group when appropriate
- To support weaker students in being able to contribute effectively
- Ensuring that all group members contribute towards creating a comfortable environment in which all students feel confident to participate
- Encouraging children to reach the directed conclusion within the allotted time given
- Supporting children in time management skills generally

Lesson Plan – Saturday 19.2.11 for S.S.S.

Sentence/ Word Level Work: Body Language Clues

Resources: e.reader book – **The Shark (Chap.1)**   by Peggy Oppong and notepaper for each group

Duration; Approximately 15-20 mins
(before a full reading of chapter 1,)

- Illicit that we assume most communication happens verbally
- Discuss other forms of communication with students
- Emphasise that authors use many ways to convey meaning through text; e.g. dialogue, action, response from other characters and the body language of characters
- Class splits into small groups and decides secretly between them, on 3 emotions they will act out through their body language
- Each group is then to perform their 3 emotions to the class
- A volunteer is to manage this part by a '3-2-1 freeze' countdown for each group to then pose each of their 3 emotions only through their body
- Volunteer leader should help their group to rehearse this
- Maximum of 3 points to be earned for each group that successfully performsfor the class to guess
- Some possible choices may be: anger, jealousy, anxiety, nervousness, shyness, depression, excitement, happiness, boredom, confusion, worry, tiredness, relief, arrogance…

Text level work: Comprehension

Duration; Approximately 1 hour
Resources; e.reader and one large piece of poster sized paper (preferably!). A marker

- Discuss as a whole class   the 4 main question types that may feature in comprehension exercises (on teaching and learning objectives page)
- Explain that each group is to quickly choose a student leader to act as spokesperson for the group when task is completed
- Explain that the exercise hopes to identify a group which gets the most questions correct
- Student groups then do shared reading of Chapter 1.

- As a group children identify each question type, e.g. Inferential or literal in addition to the agreed answer
- An elected member then scribes each answer on poster paper
- Groups then proof read their answers on completing all 10 questions
- At the end of allotted time each group reports answers back to whole class through their elected spokesperson
- Volunteer to help to decide which group wins
- E.Reader Location numbers are given at the end of some question to help students find answers
- Primary students to be given more support than JHS students

Comprehension Question – S.S.S.
The Shark (Chap. 1.) – by Peggy Oppong

1. What subject did teacher Ben Takyi teach ?   (1 mark)

2. Why didn't the teacher carry any notes to classes?
(1 mark)

3. Give three reason why students where impressed with their new teacher.   (3 marks)

4. What does the phrase 'somewhere in the shadows' mean?
(location 37 -41)   (2 marks)

5. Why do you think Benjamin Takyi had no friends at the school? Use text evidence to support your answer.   (2 marks)

6. In your own words, what was Benjamin's general attitude towards students at the school?   (2 marks)

7. What do you think informed Benjamin's choice to become a teacher? Use text evidence to support your answer.   (3 marks)

8. Discuss the possible advantages and disadvantages of teachers receiving gifts from parents.   (4 marks)

9. In your own words explain what the following words mean;
   a) befuddled   b) lounged (Location 102- 105)
c) instinctively (Location 105 – 109)

10. In your own words write down the dialogue that might have taken place between Mr. Takyi and Pearl at the end of the chapter.   (5 marks)

APPENDIX B – DETAILS ON TEXTBOOKS ON THE E-READER

E-reader textbooks at the primary and JHS levels are government published textbooks while e-reader textbooks at the SHS level are privately published. Six out of the eight e-reader textbooks had been used by teachers the previous year, while two out of the eight textbooks were new to teachers.

Textbooks on the E-Reader

Level and #	Subject	Title of Textbook on the E-Reader	Government or Private Publisher
1) **Primary**	Citizenship Education	Citizenship Education in Ghana for Primary Schools 4	Government
Comments: This book is the same book that teachers were using in paper form the year before.			
2) **Primary**	English	An English Course for Primary Schools	Government
Comments: Even though the textbook on the e-reader was a government book, it was different from the book designated by the Ghana Education Service for (E) and (E+OCE) districts. Since districts have exams based on district books, this was problematic. While the e-reader book covered grammar aspects of the district syllabus, it did not adequately cover the reading comprehension aspects of the district syllabus. As a result, one primary teacher explained that she used the paper district book as the main English textbook and used the e-reader textbook as supplementary material.			
3) **JHS**	English	Easy Learning English Language for JHS	Government
Comments: This book was the same book that teachers were using in paper form the year before.			
4) **JHS**	Social Studies	Mastering Studies for JHS	Government
Comments: This book was the same book that teachers were using in paper form the year before.			
5) **JHS**	Integrated Science	Integrated Science for JHS	Government
Comments: This book was the same book that teachers were using in paper form the year before. Even though it was the government textbook, it did not adequately cover the syllabus, and teachers recommended that the iREAD program add additional science materials to the e-reader.			
6) **SHS**	English	Effective English for SHS	Private
Comments: Teachers did not use this book in paper version last year. Moreover, to supplement this textbook, students still needed to buy required paper novels that were part of the syllabus, such as "Grief Child" and "In the Chest of a Woman."			
7) **SHS**	Social Studies	Mastering Social Studies for SHS 1	Private
Comments: This book was the same book that teachers were using in paper form the year before. One social studies teacher observed that the privately published social studies textbook on the e-reader was more appropriate for her students' level, while the government paper book was at a higher, more university-like level.			
8) **SHS**	Integrated Science	Easy Learning Integrated Science for SHS	Private

Comments: This book was the same book that teachers were using in paper form the year before. Teachers commented that this textbook did not cover all areas of the syllabus well. For example, a physics teacher pointed out that certain calculations such as those for density are not covered by the book. Another teacher explained that in all honesty, only the internet on the e-reader was beneficial for him because the aspects of integrated science that he taught were not addressed in the provided textbook.

APPENDIX C - DETAILS ON STUDENT READING PREFERENCES

The ILC Africa M&E Team's questionnaire data showed that students were interested in 2 major genres of books:

1) Books about school subjects (45.9%)
2) Fiction Books (21.1%)

Favorite Type of Genre

	(NE)			(E)			(E+OCE)			
	P	JHS	SHS	P	JHS	SHS	P	JHS	SHS	Grand Average
Books About School Subjects	66.7%	44.8%	29.8%	37.0%	51.4%	60.6%	52.9%	35.4%	43.8%	45.9%
Fiction Books	9.5%	3.4%	17.5%	44.4%	35.1%	18.2%	35.3%	22.9	12.5%	21.1%
Comedy	--	3.4%	10.5%	--	--	--	2.9%	2.1%	4.2%	3.1%
Ghanaian Language Books	7.1%	3.4%	7.0%	7.4%	--	3.0%	--	12.5%	2.1%	5.1%
Newspapers and Magazines	7.1%	--	3.5%	--	5.4%	--	--	6.3%	2.1%	3.1%
Non-Fiction Books	2.4%	--	1.8%	--	--	--	--	--	4.2%	1.1%
Poetry	4.8%	10.3%	3.5%	7.4%	--	9.1%	5.9%	6.3%	2.1%	5.1%
Religious Books	--	10.3%	8.8%	3.7%	5.4%	3.0%	2.9%	6.3%	8.3%	5.6%
Romance Books	--	6.9%	5.3%	--	--	--	--	--	--	1.4%
Self-Help Books	--	6.9%	7.0%	--	--	6.1%	--	2.1%	16.7%	4.8%
Sports Books	2.4%	10.3%	5.3%	--	2.7%	--	--	6.3%	4.2%	3.7%

(n=355)

From the online Amazon account, the tables below indicate that students primarily downloaded information in the form of subscriptions (20.3%) and samples (8.8%). Of the reading materials that students downloaded on their own – "News," "Fiction & Poetry," "Magazines, Blogs, and Other Subscriptions," and "Games" – emerged as the most popularly downloaded genres of content. This interest was above and beyond the content that Worldreader pushed onto devices (62.8%). Online Amazon accounts provide an accurate picture of students' downloads, and are more reliable than the students' self-reported reading logs.

Even though many students preferred Ghanaian story books, materials of international interest were increasingly popular among students. E-readers are also provided students with a greater international reach of reading material. The fact that they were downloading *The New York Times*, *USA Today*, and *El País* etc., points out that students wanted to access a wide range of reading materials that were previously inaccessible. Even when students were not able to

digest foreign language material like *El País*, the e-reader encouraged students to pursue their interest in other cultures and societies.

The tables below describe download information in more detail.

Descriptions of Download Types

Category
Worldreader - Books provided by Worldreader.
Subscriptions - Materials that students subscribe to on their own, which could include newspapers, magazines, blogs, "jokes of the day," etc. Since students aren't able to pay any money, they only have 14-day trial subscriptions of these materials.
Samples- Samples of books that students download on their own. Since students don't have the capability to pay, they cannot download the complete versions of these books.
Games - Games that can be played on the e-reader, which students download on their own. Some games, such as word games, might be considered educational, while others may not be.
Amazon - Messages from Amazon.
Complete Books - Free complete books that students download on their own. Free books are generally older books that are out of copyright.
Calendars - Various Kindle calendars that students download on their own.

Types of Student Downloads, Based on Last 10 Downloads

Category	(E)			(E+OCE)			(E) and (E+OCE) Combined
	P	**JHS**	**SHS**	**P**	**JHS**	**SHS**	
Worldreader	49.1%	57.2%	68.5%	56.5%	67.4%	62.2%	62.8%
Subscriptions	29.2%	18.2%	18.4%	24.0%	17.8%	22.7%	20.3%
Samples	10.2%	12.8%	9.0%	9.7%	5.4%	8.8%	8.8%
Games	7.4%	5.7%	1.9%	2.6%	3.8%	2.0%	3.4%
Amazon	1.4%	2.9%	0.8%	3.2%	4.6%	3.1%	2.7%
Complete Books	1.9%	2.5%	1.4%	3.9%	0.6%	1.3%	1.7%
Calendars	0.9%	0.7%	--	--	0.5%	--	0.3%

 (n=2787)

Expanded List of Subscription and Sample Example Downloads

Category	Examples
Subscriptions	"The New York Times" "Financial Times - US Edition" "The New Yorker" "India Today" "Moscow Times" "Business Today" "Newsweek" "The Washington Post" "One Story" "The Happiness Project" "The Onion" "Winding Road Weekly" "Commentary Magazine" "I Love My Kindle" "Overheard in New York" "Science News" "El País" "ESPN - The Football Playbook" "The Oil Drum" "2600 Magazine" "UnNamedGaming.com" "PopSci.com" "Joke of the Day" "Bible Verse of the Day" "Amazon's Toy Whimsy Blog"
Samples	"Ghost Soldiers"

"Ultimate Word Success"
"Passion For Poetry"
"Decision Points"
"Talk of the Town"
"Pinheads and Patriots"
"Into the Wild"
"A Horse to Love"
"Sweet Baklava"
"Tulasi Das"
"Free books for Kindle"
"A Taste of Magic"
"RX from the Garden"
"Stories I Only Tell My Friends"
"Know Your Bible"
"All About FC Barcelona"
"Obama Search Words"
"Sports Betting Systems"
"Children's Classic Stories"
"Summer: An Alphabet Acrostic"
"Lost in Kandahar"
"Video Games Uncovered"
"Learning by Doing"
"My Father's Dream"
"Man's Search for Meaning"

Stratified Listing of Student Downloads*, Based on Last 10 Downloads

Category	(E)			(E+OCE)			
	P	JHS	SHS	P	JHS	SHS	(E) and (E+OCE) Combined
News	31.8%	18.2%	20.0%	35.3%	21.2%	23.0%	20.6%
Fiction & Poetry	16.2%	13.8%	21.5%	17.1%	13.7%	17.6%	16.7%
Magazine, Blog, or Other Subscriptions	8.0%	12.4%	27.3%	6.9%	16.6%	19.8%	14.2%
Games	19.3%	19.7%	8.7%	8.8%	17.9%	8.0%	11.7%
Non-Fiction & Advice	9.1%	16.8%	8.7%	13.7%	6.0%	6.4%	8.5%
Sports	4.5%	1.5%	8.7%	5.9%	13.9%	5.3%	6.0%
Kindle-Related	5.7%	5.1%	13.3%	4.9%	7.3%	3.7%	5.8%
Religious	1.1%	9.5%	7.3%	5.9%	3.3%	3.7%	4.6%
Cars	10.2%	4.4%	2.7%	5.9%	5.3%	4.8%	4.4%
Science & Technology	4.5%	5.8%	2.7%	4.9%	5.3%	7.0%	4.4%
Foreign Language	3.4%	4.4%	0.7%	7.8%	1.3%	0.5%	2.2%
Calendars	2.3%	2.2%	--	--	2.0%	--	0.8%

(n=944)
*Student downloads include Subscriptions, Samples, Games, Complete Books, and Calendars. Student downloads to not include materials that Worldreader or Amazon downloads onto devices.

Example Downloads by Genre

Category	Examples
News	"The International Herald Tribune" "USA Today" "The Mail & Guardian"
Fiction & Poetry	"The Paris Wife: A Novel" "Vampire Moon" "Playful Poems"
Magazine, Blog, or Other Subscriptions	"Reader's Digest" "rachelray.com - Food Blog" "Modern Healthcare"
Games	"Solitaire To Go!" "Mega Game Pack for Kindle" "Sudoku Volume II"

Non-Fiction & Advice	"Townie: A Memoir"
	"Vegetable Gardening"
	"How to Write an Essay"
Sports	"ESPN - The Football Playbook"
	"SoccerLens"
	"EPL Talk"
Kindle-Related	"I love my Kindle"
	"Free Books for Kindle"
	"Amazon Daily"
Religious	"The Holy Bible"
	"The Kindle Qur'an"
	"Bible Verse of the Day"
Cars	"Winding Road Weekly"
Science & Technology	"Science News"
	"PC Magazine"
	"AP Science"
Foreign Language	"El País"
	"La Nación"
	"Die Zeit"
Calendars	"2011 Kindle Calendar"
	"2012 Calendar and Beyond"
	"Best 2011 Kindle Calendar"

GHANAIAN BOOKS vs. INTERNATIONAL BOOKS

Overall, the majority of focus group students preferred Ghanaian books to international books. Many students reported that they simply could not understand international books because the vocabulary, diction, and content were too unfamiliar. As one student expressed, it is too difficult to imagine stories that take place in Europe. The length of international books also posed a problem for many students, as one high school student exclaimed, "It takes a month to read one of those books!"

In focus group discussions, students who preferred Ghanaian books explained that the works were easier to read. These students further explained that Ghanaian books were generally short in length and written in simple and familiar Ghanaian English. Students also expressed that they enjoyed Ghanaian books because they took place in familiar settings and taught the reader more about Ghanaian culture. Students appreciated that Ghanaian books often incorporated phrases in local languages and included illustrations. Students also liked that Ghanaian stories tended to provide advice and moral lessons.

Other students preferred books by international authors. Students who wanted to improve their English disliked the local language phrases and typographical errors found in Ghanaian books and preferred the advanced vocabulary and "proper" British or American English found in many international books. These students enjoyed lengthier books and appreciated the opportunity to learn about other cultures and lifestyles. Some students commented that international books tended to have more adventurous or imaginative stories.

The preference for Ghanaian books by Ghanaian authors is clearly supported in the five most commonly read books among (E) and (E+OCE) students' across all three grade levels (primary/JHS/SHS).

The five most commonly read books among (E) and (E+OCE) primary students were all Ghanaian story books for beginner students:

1. *At the Beach* by Barbara Baddoo
2. *All About Me* by Barbara Badoo

3. *At the Cocoa Farm* by Barbara Badoo
4. *Come and Play* by Barbara Baddoo
5. *Long Long Ago* by Pamela Aba Woode

The five most commonly read books among (E) and (E+OCE) JHS students were all Ghanaian story books for intermediate students:

1. *Ananse's Magic* Drum by Michael Ofori Mankata
2. *Kofi Has Malaria* by Barbara Badoo
3. *The Golden Forest* by Michael Ofori Mankata
4. *No Empty Dream* by Ida Fynn Thompson
5. *My Brother the Footballer* by Diana McBagonluri

Four of the five most commonly read books among (E) and (E+OCE) SHS students were Ghanaian story books for intermediate readers. One of the five most commonly read books, *Every Word*, was in fact not a book but an educational word game on the e-reader that students frequently listed on their self-reported logs. The popularity of *Every Word* suggests the e-reader's potential to engage students through educational games. The titles of the five most commonly read books among (E) and (E+OCE) SHS students are as follows:

1. *The Shark* by Peggy Oppong
2. *My Brother the Footballer* by Diana McBagonluri
3. *The Golden Forest* by Michael Ofori Mankata
4. *Every Word* by Amazon Digital Services
5. *Happiness at Last* by Marian Aryiku

Both JHS and SHS students commonly read intermediate level books, indicating that SHS students are most comfortable reading materials that are at an intermediate level. SHS students may also be drawn to intermediate level books because there are no Ghanaian storybooks on the e-reader that are at an advanced level. Only international adult classics and materials that students download on their own are at an advanced level.

APPENDIX D – DETAILS ON STUDENT SELF-REPORTED DATA ON READING OUTSIDE OF SCHOOL

In total, the M&E Team collected **6,825 out of 14,911** student weekly logs forms over the 31 weeks since the start of the project, totaling a 46% completion rate. By group, the No E-Reader (NE) group had a cumulative average completion rate of 39%, the E-Reader (E) group had a rate of 57%, and the E-Reader plus Out of Classroom Exploration (E+OCE) group had a completion rate of 38%.

The period from 6th December 2010 to 10th July 2011 is a 31-week window, generally grouped into 4 week periods for the purposes of ongoing monitoring. Between July 22nd and August 21st, the total number of participating students was 481 across the three groups (NE/E/E+OCE) and three grade levels (P/JHS/SHS).

Percentage of Weekly Log Completion by Group

Groups	Weekly Log Completion by Group
No E-Reader Group (NE)	39%
E-Reader Group (E)	57%
E-Reader Group, Out of Classroom Exploration (E+OCE)	38%
(NE), (E), and (E+OCE) Combined	46%

(n=6,825)

Students self-reported the number of books that they read daily. This information was used to calculate the average number of books they read each week, from December to July. The

assessment team discovered unrealistic self-reporting in the initial months of the study. In response, the M&E team conducted "honesty modules" where students were encouraged to be more truthful in self-reporting. Except for the first two months of study when students were becoming accustomed to the logs, students across the three groups consistently read an average of 6-7 books per week over the duration of the study, suggesting that there has not been reading fatigue.

Average Number of Books Accessed per Week (Self-Reported)

Groups	0-4 wks (06Dec– 02Jan)	4-8 wks (03Jan– 30Jan)	8-12 wks (31Jan– 27Feb)	12-16 wks (28Feb– 27Mar)	16-20 wks (28Mar– 24Apr)	10-24 wks (25Apr– 22May)	24-28 wks (23May- 19Jun)	28-31 wks (20Jun- 10Jul)	Cumulative Average
(NE)	9	6	6	6	5	7	6	6	**6**
(E)	5	4	7	7	6	7	6	6	**6**
(E+OCE)	6	6	7	7	6	7	7	6	**7**

n=6,825

It is also important to note that there are clear limitations to self-reported student logs. When students are aware that adults, other than their teachers, are checking to see how much they read, there is an incentive to please them by indicating that they are reading more. At the (NE) group schools in particular, this effect may have been amplified. Unaware that their school is being used as a control group, teachers and administrators may have believed that the study was monitoring students' reading habits with the purpose of evaluating the quality of the school and its staff and may therefore have encouraged students to read more. When assisting students with weekly logs, ILC Africa staff observed teachers at control (NE) group schools expressing ideas such as, "Reading is good for your mind. If you read a lot and list a lot of books, who knows, you might get a scholarship and go to America." This promotion of reading at the control schools indicates that the filling of student weekly logs itself may increase student reading, and that students in the control groups may read more during the study than on average.

In focus group discussions, (NE) students expressed that they were pressured to read by teachers and parents, especially since the introduction of the student weekly reading logs. Some (NE) students reported reading outside of school every day for about an hour, while other students reported reading occasionally for 15-60 minutes at a time. At the primary level, focus group participants reported having access to 2-7 books at home, while SHS level focus group participants had access to around 20 books at home. This limited access to books indicates that students may not have accurately represented the books they read on student logs, especially considering that students reported completing an average of 3 books per week over the duration of the study.

APPENDIX E – STUDENT PARTICIPATION IN iREAD VACATION SCHOOL

Attendance records reveal that overall, 178 students participated in the iREAD Vacation School. 47% (84) of attendees were students who participated in the iREAD study and who had had e-readers during the 2010-2011 academic year, while 53% (94) attendees were students who were either enrolled at (E) and (E+OCE) schools but were not part of the study or were enrolled in different schools. 46 students participated at the primary level, 84 students participated at the JHS level, and 48 students participated at the SHS level. Primary and SHS participation was lower than JHS participation. Primary participation is likely lower because the number of project-affected primary students is lower than the number of project-affected JHS and SHS students, due to smaller stream sizes at the primary level. At the SHS level, participation was

probably lower because many SHS students are boarding students and live far away from the schools. The table below outlines iREAD Vacation School participation numbers.

Participants in iREAD Vacation School

Level	Total No. of Participants	No. of Participants from (E) and (E+OCE) Groups	No. of Participants from Outside of the Study
Primary	46	26 (57%)	20 (43%)
JHS	84	44 (52%)	40 (48%)
SHS	48	14 (29%)	34 (71%)
TOTAL	178	84 (47%)	94 (53%)

APPENDIX F – CHOOSING STANDARDIZED TESTING TOOLS, AND STANDARDIZED TESTING LIMITATIONS

At the beginning of the project, the M&E team took into consideration a variety of standardized tests. Initially, the M&E team had hoped to administer significant excerpts from both regional/national standardized tests as well as international tests. However, schools made it clear that students should not spend more than a few hours participating in standardized testing and other activities associated with each interval evaluation. As a result, the M&E team determined that it would be best to focus students' limited time towards regional/national standardized tests that reflect local curriculums. The SEA, BECE, and WASSCE exams are the most widely recognized regional exams at the primary, JHS, and SHS levels.

The SEA exam is an assessment designed by the USAID-funded Ghana Basic Education Comprehensive Assessment System (BECAS) project. The SEA exam is intended to show how well Primary 4 students understand core objectives within the English curriculum.

The BECE exam is an assessment designed by the West African Examination Council (WAEC). Test takers are usually JHS 3 students, and scores from the BECE exam are primarily used by high schools as a factor in determining high school admission.

Like the BECE, the WASSCE exam is also designed by WAEC. Test takers are usually SHS 3 students, and scores from the WASSCE exam are primarily used by universities as a factor in determining university admission.

However, the three standardized tests, particularly the SEA and BECE exams, are not perfectly standardized from test to test. As a result, increases or decreases in scores could be attributed to circumstances such as changes in the level of difficulty of the test, changes in sub-question types, or changes in the testing format (i.e., multiple choice to free answer etc.) Additionally, the total number of questions on the standardized tests vary from version to version, complicating analysis.

Another limitation is that the only standardized tests that are culturally and contextually appropriate for the JHS and SHS levels are the BECE and WASSCE exams, which are designed for JHS 3 and SHS 3 students. However, students within the study are two grades below the grade in which the test is officially administered. Therefore, the BECE exam designed for JHS 3 students was administered to JHS 1 students. It should be expected that the reading and content level are above the average competency of a JHS 1 student. Similarly the WASSCE exam designed for SHS 3 students was administered to SHS 1 students. Again, it should be expected that the reading and content level are above the average competency of a SHS 1 student. The difficult content of the BECE and WASSCE exams may have made improvements in scores smaller than if students had been given easier

exams, especially considering that for multiple choice sections, some students scored very close to the 25% chance score of random guessing.

Due to limitations in students' time, the M&E team did not include international oral reading fluency tests. However, anecdotal observations suggest that students' oral fluency improved over the course of the project. Future studies should therefore involve oral reading fluency tests.

Additionally, the introduction of logs to document daily reading within the control (NE) groups which may have positively influenced (NE) students to read more, further lessening the reading improvement gap between active and control groups. When students are aware that adults, other than their teachers, are checking to see how much they read, there is an incentive to please them by indicating that they are reading more. At the (NE) group schools in particular, this effect may have been amplified. Unaware that their school is being used as a control group, teachers and administrators may have believed that the study was monitoring students' reading habits with the purpose of evaluating the quality of the school and its staff and may therefore have encouraged students to read more. When assisting students with weekly logs, ILC Africa staff observed teachers at control (NE) group schools expressing ideas such as, "Reading is good for your mind. If you read a lot and list a lot of books, who knows, you might get a scholarship and go to America." This promotion of reading at the control schools indicates that the filling of student weekly logs itself may increase student reading, and that students in the control groups may read more during the study than on average.

APPENDIX G – DEMOGRAPHIC INFORMATION ON STANDARDIZED TEST TAKERS

The table below indicates the gender distribution of the number of students who participated in Standardizes test during the three terms. Column A captures only the number of students who participated in all the tests from the baseline through to the Final term whiles Column B captures the number of students who participated in each level of the test irrespective of whether they took the test in all the three terms. A comparison of the column A and B indicates some level of attrition in sample. About 189 students who participated in the test in the baseline did not participate in the test in final evaluation. As a result of this, there is the general concern of this affecting the robustness of the result, thus we conducted our results based on these two different numbers of students.

Gender Distribution of Students Who Took the Test

		A				B		
		Number of Students who took Test in All the Terms				Number of Students who took test at each Term		
	Gender	Baseline	Mid-Term	Final Term		Baseline	Final Term	Final Term
Primary	Female	38	38	38		61	48	39
	Male	37	37	37		58	46	38
	Total	**75**	**75**	**75**		**119**	**94**	**77**
JHS	Female	52	52	52		67	56	56
	Male	54	54	54		81	61	61

	Total	**106**	**106**	**106**	**148**	**117**	**117**
SHS	Female	76	76	76	111	80	83
	Male	52	52	52	118	67	70
	Total	**128**	**128**	**128**	**229**	**147**	**153**
n=		**309**	**309**	**309**	**496**	**358**	**347**

The table below outlines the number of students who took all three exams in each individual school.

Number of Test-Takers Who Took All Three Exams, By School

Level	(NE) Group	(E) Group	(E+ OCE) Group	Total
Primary 4	28	20	27	75
JHS 1	17	36	53	106
SHS 1	31	56	41	128
Sub total	**76**	**112**	**121**	**309**

APPENDIX H – STATISTICAL SIGNIFICANCE OF STANDARDIZED TEST SCORES

(NE) Primary Group

```
. ttest  totalscore_0= totalscore_2 if  groupname== "NEN"

Paired t test
─────────────────────────────────────────────────────────────────────────
Variable │    Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼───────────────────────────────────────────────────────────────
totals~0 │     28    .2547857    .0189533    .1002916    .2158967    .2936747
totals~2 │     28    .3357857    .0294962    .1560794    .2752645    .396307
─────────┼───────────────────────────────────────────────────────────────
    diff │     28       -.081     .023717    .1254987   -.1296633   -.0323367
─────────────────────────────────────────────────────────────────────────
     mean(diff) = mean(totalscore_0 - totalscore_2)            t = -3.4153
Ho: mean(diff) = 0                             degrees of freedom =      27

Ha: mean(diff) < 0            Ha: mean(diff) != 0           Ha: mean(diff) > 0
Pr(T < t) = 0.0010         Pr(|T| > |t|) = 0.0020         Pr(T > t) = 0.9990
```

The above table is the t test measuring whether there exist a statistically significant difference in the means test scores under baseline and final term evaluations of the students in the primary level of education for the NEN group. There are three tests in all but we focus only the relevant test. The stated hypothesis is as follows:

Test1

Null hypothesis: The mean scores of baseline and final test are equal

Alternative hypothesis: The mean scores for baseline is less than final tests

This test was conducted at 5% level of significance. The result as calculated by Stata indicates a p-value of 0.001 (1%). Thus, if we compared with level of significance of 5%, then we can reject the null hypothesis of mean equality in order to avoid the Type II error of accepting a false null hypothesis. Thus, we reject the null hypothesis and conclude that for the (NE) group under the primary level of education, the mean scores of students in the final term is greater than the mean scores of students in baseline.

Conclusion:

The mean test scores for students in the final tern evaluation is statistically and significantly greater than the mean test scores for the students in the baseline for students in primary level of education for the control group.

(E) Primary Group

```
. ttest  totalscore_0= totalscore_2 if groupname=="ERE"

Paired t test
─────────────────────────────────────────────────────────────────────────────
Variable │    Obs       Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼───────────────────────────────────────────────────────────────────
totals~0 │     20     .37795    .0322726    .1443273    .3104027    .4454973
totals~2 │     20     .50715     .032921    .1472271    .4382456    .5760544
─────────┼───────────────────────────────────────────────────────────────────
    diff │     20     -.1292    .0252039    .1127151   -.1819523   -.0764477
─────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(totalscore_0 - totalscore_2)          t =  -5.1262
Ho: mean(diff) = 0                             degrees of freedom =       19

 Ha: mean(diff) < 0          Ha: mean(diff) != 0          Ha: mean(diff) > 0
 Pr(T < t) = 0.0000       Pr(|T| > |t|) = 0.0001       Pr(T > t) = 1.0000
```

For the (E) group, the test indicates that mean test scores for the final evaluation for students is statistically and significantly greater than mean test scores for students in the baseline evaluation. The p-value as obtained here is 0%, an indication that even at 1% level of significance the mean test scores in the final evaluation is significantly greater than that of mean test scores in the baseline.

(E+OCE) Primary Group

```
. ttest  totalscore_0= totalscore_2 if groupname=="EOC"

Paired t test
─────────────────────────────────────────────────────────────────────────────
Variable │    Obs       Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼───────────────────────────────────────────────────────────────────
totals~0 │     27   .2793704    .0286714    .1489812    .2204354    .3383054
totals~2 │     27    .435963    .0368067    .1912534    .3603056    .5116203
─────────┼───────────────────────────────────────────────────────────────────
    diff │     27  -.1565926     .025738    .1337383   -.2094977   -.1036875
─────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(totalscore_0 - totalscore_2)          t =  -6.0841
Ho: mean(diff) = 0                             degrees of freedom =       26

 Ha: mean(diff) < 0          Ha: mean(diff) != 0          Ha: mean(diff) > 0
 Pr(T < t) = 0.0000       Pr(|T| > |t|) = 0.0000       Pr(T > t) = 1.0000
```

For the E+OCE groups the test indicates that the mean scores of students in the final test were statistically and significantly greater than the mean test scores of students in the baseline.

(NE) JHS Group

. ttest totalscore_0= totalscore_2 if groupname=="NEN"

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
totals~0	17	.1994118	.0196938	.0811996	.1576628	.2411608
totals~2	17	.2111765	.029974	.1235861	.1476344	.2747186
diff	17	-.0117647	.0220833	.0910519	-.0585793	.0350498

```
    mean(diff) = mean(totalscore_0 - totalscore_2)              t =  -0.5327
Ho: mean(diff) = 0                             degrees of freedom =       16

Ha: mean(diff) < 0          Ha: mean(diff) != 0          Ha: mean(diff) > 0
Pr(T < t) = 0.3008      Pr(|T| > |t|) = 0.6015          Pr(T > t) = 0.6992
```

For the (NE) group under the JHS level of education, the test indicates that we accept the null hypothesis of no statistically significant difference in the baseline test score as compared to the final test scores. This is an indication that there is no significant improvement in the performance of the students in the NE group for JHS.

(E) JHS Group

. ttest totalscore_0= totalscore_2 if groupname=="ERE"

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
totals~0	36	.2263889	.0156203	.0937216	.1946781	.2580997
totals~2	36	.2766667	.0228105	.1368628	.230359	.3229744
diff	36	-.0502778	.0155965	.0935792	-.0819404	-.0186151

```
    mean(diff) = mean(totalscore_0 - totalscore_2)              t =  -3.2237
Ho: mean(diff) = 0                             degrees of freedom =       35

Ha: mean(diff) < 0          Ha: mean(diff) != 0          Ha: mean(diff) > 0
Pr(T < t) = 0.0014      Pr(|T| > |t|) = 0.0027          Pr(T > t) = 0.9986
```

For the (E) JHS group, the test indicates that we reject the null hypothesis and conclude that the mean test scores in the final evaluation is significantly greater than the mean test scores in the baseline for students (E) JHS level.

(E +OCE) JHS Group

```
. ttest  totalscore_0= totalscore_2 if groupname=="EOC"

Paired t test
─────────────────────────────────────────────────────────────────────────────
Variable │     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼───────────────────────────────────────────────────────────────────
totals~0 │      53         .25     .0147696    .1075246    .2203626    .2796375
totals~2 │      53    .2362264     .0186543    .1358057    .1987937    .2736591
─────────┼───────────────────────────────────────────────────────────────────
    diff │      53    .0137736     .0172748    .1257627   -.0208909    .0484381
─────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(totalscore_0 - totalscore_2)            t =   0.7973
Ho: mean(diff) = 0                              degrees of freedom =       52

Ha: mean(diff) < 0             Ha: mean(diff) != 0            Ha: mean(diff) > 0
Pr(T < t) = 0.7856          Pr(|T| > |t|) = 0.4289          Pr(T > t) = 0.2144
```

For students in the E+OCE group, the statistical test indicates that there is no significant difference in the test scores of the students in both the baseline and final evaluations. Thus, we conclude means equality here.

(NE) SHS Group

```
. ttest  totalscore_0= totalscore_2 if groupname=="NER"

Paired t test
─────────────────────────────────────────────────────────────────────────────
Variable │     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼───────────────────────────────────────────────────────────────────
totals~0 │      47    .2644681     .0087878    .0602462    .2467791     .282157
totals~2 │      47     .482766     .0122331    .0838659     .458142    .5073899
─────────┼───────────────────────────────────────────────────────────────────
    diff │      47   -.2182979     .0112795    .0773282   -.2410023   -.1955935
─────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(totalscore_0 - totalscore_2)            t = -19.3535
Ho: mean(diff) = 0                              degrees of freedom =       46

Ha: mean(diff) < 0             Ha: mean(diff) != 0            Ha: mean(diff) > 0
Pr(T < t) = 0.0000          Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

For the SHS, the result indicates that for the control group, the mean test scores for students in the final evaluation is statistically significantly greater than mean test scores in the baseline. The result is highly significant even at 1% level of significance.

(E) SHS Group

```
. ttest  totalscore_0= totalscore_2 if groupname=="ERE"

Paired t test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
totals~0	60	.2551667	.0110354	.0854795	.233085	.2772484
totals~2	60	.4268333	.0134069	.1038495	.4000062	.4536605
diff	60	-.1716667	.0108356	.0839323	-.1933487	-.1499847

```
      mean(diff) = mean(totalscore_0 - totalscore_2)              t = -15.8428
Ho: mean(diff) = 0                              degrees of freedom =       59

Ha: mean(diff) < 0            Ha: mean(diff) != 0            Ha: mean(diff) > 0
Pr(T < t) = 0.0000        Pr(|T| > |t|) = 0.0000           Pr(T > t) = 1.0000
```

For the E-reader group under the SHS, the statistical test shows that means test scores for students in the final term is statistically significantly greater than the mean test scores for the students in the baseline as we reject the null hypothesis of mean test equality in favour of the alternative hypothesis.

(E+OCE) SHS Group

```
. ttest  totalscore_0= totalscore_2 if groupname=="EOC"

Paired t test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
totals~0	46	.3071739	.0123971	.084081	.2822049	.3321429
totals~2	46	.4913043	.0124668	.084554	.4661949	.5164138
diff	46	-.1841304	.0113511	.076987	-.2069928	-.1612681

```
      mean(diff) = mean(totalscore_0 - totalscore_2)              t = -16.2213
Ho: mean(diff) = 0                              degrees of freedom =       45

Ha: mean(diff) < 0            Ha: mean(diff) != 0            Ha: mean(diff) > 0
Pr(T < t) = 0.0000        Pr(|T| > |t|) = 0.0000           Pr(T > t) = 1.0000
```

Here, we also reject the null hypothesis in favour of the alternative hypothesis.

APPENDIX I – STANDARDIZED TEST SCORES FOR ALL STUDENTS, REGARDLESS OF WHETHER THEY TOOK ALL EXAMS

		NE Group				E Group				E+OCE Group			
		Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)	Base-line	Mid-Term	Final Term	% Change (Base-line to Final)
P	Avg. raw score	16.8/ 68	18.3/ 56	23.5/ 70		25.6/ 68	25.7/ 56	35.1/ 70		17.9/ 68	23.9/ 56	30.5/ 70	
	Avg. % score	24.7%	32.6%	33.6%	8.9%	37.7%	45.9%	50.2%	12.5%	26.4%	42.7%	43.6%	17.2%
JHS	Avg. raw score	16.6/ 82	20.1/ 100	21.7 /99		18.9/ 82	19.8/ 100	27.5/ 99		20.0/ 82	22.0/ 100	22.8/ 99	
	Avg. % score	20.3%	20.1%	22.0%	1.7%	23.0%	19.8%	27.7%	4.7%	24.4%	22.0%	23.0%	-1.3%
SHS	Avg. raw score	36.2/ 134	47.3/ 134	65.1/ 135		35.1/ 134	41.8/ 134	57.6/ 135		41.3/ 134	54.3/ 134	66.3/ 134	
	Avg. % score	27.0%	35.3%	48.2%	21.2%	26.2%	31.2%	42.7%	16.5%	30.8%	40.5%	49.1%	18.4%

APPENDIX J – MOST COMMON TEACHER & STUDENT REQUESTS

A list of most common requests from students and teachers are identified below:

- E-readers need additional books for leisure
- E-readers need Ghanaian story books for advanced readers
- E-readers need a dictionary with simplified language
- E-readers should include local-language literature
- E-readers need more books at primary students' reading levels
- More effort it needed to edit books to screen out typos and mistakes, which are common in Ghanaian books.
- E-readers should entertain the idea to publish student stories
- Update e-readers to a colored screen rather than the current black and white screen
- Remove the e-reader's music capabilities so that students can focus more on the device's educational aspects (teacher recommendation)
- Censor internet access so that students cannot access inappropriate material
- Improve the device's capability to display diagrams and pictures
- Provide ear pieces for the e-reader
- Make the device slightly larger so that it is the size of an average textbook
- Add a strap to the e-reader case so that students can hang it over their shoulder
- Develop a way for the device to track how much time students spend on reading vs. entertainment (music, games, and internet)
- Make the network faster for downloading books
- Decrease freezing on the e-reader
- Touch screen could improve the e-reader device
- The text-to-speech function should read with a Ghanaian/British accent and have a slower speed option. Also, the text-to-speech function should better pronounce local names and words. For example, the common local name "Yaa" is currently pronounced as if it were an acronym, YAA
- The background of the device should be bright white rather than light gray
- Light should be incorporated into the e-reader device
- Extra class time could better engage students
- Students want more OCE activities

APPENDIX K – SELECT LIST OF STUDIES SUPPORTING READING INTERVENTIONS FOR PRE-SCHOOL AND PRIMARY SCHOOL AGED CHILDREN

No.	Title	Author(s)
1	Development of Emergent Literacy and Early Reading Skills in Preschool Children: Evidence From a Latent-Variable Longitudinal Study	Christopher J. Lonigan, Stephen R. Burgess, and Jason L. Anthony
2	Effective academic interventions in the United States: evaluating and enhancing the acquisition of early reading skills	Roland H. Good III, Deborah C. Simmons, and Sylvia B. Smith
3	Early Reading Acquisition and Its Relation to Reading Experience and Ability 10 Years Later	Anne E. Cunningham, Keith E. Stanovich
4	Learning to Read and Write: A Longitudinal Study of 54 Children from First through Fourth Grades	Connie Juel
5	Phonics and the Beginning Reader	Wiley Blevins
6	The Importance of Early Decoding	Isabel L. Beck and Connie Juel
7	What Reading Does for the Mind	Anne E. Cunningham and Keith E. Stanovich
8	Matthew Effects in Reading: Some Consequences of Individual Differences in the the Acquisition of Literacy.	Keith E. Stanovich

APPENDIX L – CHANGE IN SCORE FROM BASELINE TO FINAL BY MOTHER'S HIGHEST LEVEL OF EDUCATION

The table below outlines changes in student standardized test scores from baseline to final by mother's highest level of education. At this time, the study does not demonstrate any clear trends. Only 309 students across the 9 schools took the exam at both the baseline and final points in the study, representing 17-56 students at each school. When these 17-56 students at each school are further disaggregated by the five categories for mother's highest level of education (no school/p/jhs/shs/shs+), the total number for each disaggregated category is very low. Larger sample sizes would reveal a clearer understanding of the relationship between mother's highest level of education and improvement in reading performance.

Change in Score from Baseline to Final by Mother's Highest Level of Education

	NE Group					E Group					E+OCE				
	No School	P	JHS	SHS	SHS+	No School	P	JHS	SHS	SHS+	No School	P	JHS	SHS	SHS+
P	+1.5%	+12.6%	+9.6%	+1.3%	+1.3%	--	+12.9%	--	--	--	+15.7%	--	--	--	--
JHS	-0.3%	+16.5%	+5.0%	+1.4%	--	+20.3%	+5.5%	+93.5%	+17.3%	+18.2%	-22.6%	+60.3%	-62.9%	-49.2%	+12.4%
SHS	+17.2%	+21.8%	+23.7%	+21.6%	+18.5%	+18.2%	+12.5%	+16.6%	+18.2%	+25.3%	+17.4%	+17.1%	+21.3%	+20.0%	+25.0%

(n=309)

APPENDIX M – CHANGE IN SCORE FROM BASELINE TO FINAL BY CAPACITY OF STUDENT

At the onset of the project, there was some debate as to whether weaker students or stronger students would most benefit from the device. The table below compares baseline scores to final scores. At this time, however, data is still inconclusive. More time may be needed with the e-reader intervention to show results.

Change in Score from Baseline to Final by Capacity of Student

	(NE) Group			(E) Group			(E+OCE) Group		
	Lower Third	**Middle Third**	**Upper Third**	**Lower Third**	**Middle Third**	**Upper Third**	**Lower Third**	**Middle Third**	**Upper Third**
Primary	+8.3%	+9.7%	+5.9%	+21.2%	+9.2%	+7.7%	+20.6%	+7.4%	+18.8%
JHS	-0.3%	+4.3%	-0.8%	+4.1%	+4.5%	+6.7%	-0.5%	+0.2%	-4.2%
SHS	+24.2%	+20.8%	+19.7%	+19.0%	0%	+17.8%	+20.6%	+17.3%	+16.9%

(n=309)

APPENDIX N – COST COMPARISON, FOR INDIVIDUAL CONSUMERS, BETWEEN THE PAPER SYSTEM AND E-READER SYSTEM FOR THE YEARS 2014-2017

Cost Comparison, for Individual Consumers, Between the Paper System and E-Reader System for the Years 2014-2017

		Avg. Price per Textbook (USD)*	No. of Textbooks per Year for One Student	No. of Years **	Total Cost of Books (USD)	Cost of One E-Reader Device (USD)	Cost of E-Reader Accessories, Set-Up, Training, and Support (USD)	Total Cost over 4 Years (USD)	Cost Difference Between E-Reader and Paper Systems Over 4 Years (USD)
Primary	Paper System	$3.78	9	3	$102.06	N/A	N/A	102.06	
Primary	E-Reader System	$1.51	9	3	$40.82	$50.00	$20.00	110.82	8.76
JHS	Paper System	$6.30	10	3	$189.00	N/A	N/A	189.00	
JHS	E-Reader System	$2.52	10	3	$75.60	$50.00	$20.00	145.60	-43.40
SHS	Paper System	$9.43	8	3	$226.32	N/A	N/A	226.32	
SHS	E-Reader System	$3.77	8	3	$90.53	$50.00	$20.00	160.53	-65.79

*For the paper system, average price per textbook figures are the average price provided by EPP Bookstore. For the e-reader system, average price per textbook figures are estimated at 40% of the paper book price. E-books are significantly cheaper than paper books because they eliminate costs related to distribution, paper, and ink.

**Although it is estimated that e-readers and paper books could last more than three years before becoming damaged or outdated, this cost analysis uses three years because there are only three primary years that use English as the language of instruction (Primary 4-6), three JHS years, and three SHS years.

Appendix O – Data Collection Tools

A - Student Weekly Log

Student Name:_____
School Name:_____   **Stage/Grade Level:**_____

A1. Please fill the table below for books you have read <u>OUTSIDE OF SCHOOL HOURS.</u> Use extra paper if you need more room to write the books you've read.

Day and Date	Title	How many minutes did you spend reading this book?	Have you finished the book? Yes=Y or No=N	Why did you read this book? For fun or for school? Fun=F or School=S	What kind of book was this? E-book=E or Paper Book=P
Monday **Date_____**					
Tuesday **Date_____**					
Wednesday **Date_____**					
Thursday **Date_____**					
Friday **Date_____**					
Saturday **Date_____**					
Sunday **Date_____**					

A2. Apart from the list of books in A1, have you read any other magazines, newspapers, or reading materials this week? Please list the titles of the magazines, newspapers, etc. below.

A3. What book, magazine, newspaper, or reading material did you like the best this week? Why?

A4. Have you had any technical problems using your e-reader this week? If yes, please explain.

A5. Did you learn any new e-reader function this week? If yes, please explain.

A6. On a scale of 1 to 5, how confident did you feel in using the e-reader this week? (Circle one choice below)

1- Not confident at all.
2- Below average confident.
3- Confident.
4- Above average confident.
5-   Highly confident.

B – Teacher Weekly Log

Teacher Name:_____ School Name:_____
Class Subject (if applicable):_____

IMPORTANT NOTE: Please answer all questions as they pertain to the stream of students who have e-readers.

B1. Please fill the table below.

	Monday, Date_____	Tuesday, Date_____	Wednesday, Date_____	Thursday, Date_____	Friday, Date_____
Today, how long was total class time, in minutes?					
Of the total class time today, approximately how many minutes did you and/or the students spend actively using the e-reader in the classroom?					
If you used the e-reader today, please give the title(s) of the book(s) you used.					
Did you use a paper version of the book(s) listed above last year? Yes=Y or No=N					
Apart from e-books, did you use any paper books or paper reading materials in the classroom today? If yes, please provide their titles.					

B2. Have you used any teaching methods or lesson plans encouraged by Ms. Samaiyah Aziz and Worldreader this week? Please explain.

B3. Have there been technical problems with your or your students' e-readers this week? If yes, please describe.

B4. Any other comments, suggestions, or feedback.

E- Key Informant Interview (Teachers)

Interviewer Name:

Date:
Time Start: **Time End:**

Teacher Name:
School Name:
Teacher Phone Number:

ET1.   What are the classroom reading materials that you currently use for your subject(s)? (Interviewer: Fill the table below.)

No	Title	Published by the government or a private publisher?	Paper book or e-book or both?
1			
2			
3			
4			
5			
6			
7			
8			

ET2.   When did the government reading materials that you are supposed to use for your subject(s) arrive this year?

ET3.   Now that you have the e-reader, does each student in the classroom currently receive his or her own copy of classroom books? Explain.

ET4.   Since the start of the iREAD project in early December 2010, how much of your own money did you spend to give students access to reading materials? Please explain.

ET5.   Do students spend their own money for classroom reading materials, such as book and photocopies? If yes, how much do you estimate that students in your class spent on classroom reading materials since the start of the iREAD project in early December 2010?

ET6. What is the greatest challenge in general that affects your ability to deliver quality teaching?

[For E, E+OCE Teachers Only, Kade and Adeiso]

ET7.   If you have received an e-reader, how do you use it in your classroom for your subject?

ET8.   In your opinion, what have been the positive effects of the e-reader? In the classroom? On students? On teachers?

ET9.   Have there been any negative effects?

ET10.   Have you noticed any improvement in reading or writing that you think is because of the e-reader? Explain.

ET11.   If you have noticed improvements, how are you observing this? From grading homework assignments, listening to students read aloud, etc?

ET12.   Have you had any challenges with the e-readers? Explain

ET13.   Is there anything about the e-reader device that you would improve to make the device better for the classroom?

ET14.   Have you noticed any gaps in enthusiasm? Between what types of students, e.g. students with worse English skills? Older students? Less-motivated stedunts? How has enthusiasim changed over the course of the project, ever since the first e-readers were given to the student?

ET15. How are you helping the students who are relatively weak at reading/writing to improve?

ET16. What do you like to read on the e-reader?

[For NE Schools only, Teacher Mante and Suhum]

ET1. How is reading incorporated into your current lesson plans?

ET17. Have you noticed any improvement in reading or writing among students in the study? If so, how are you observing this? From grading homework assignments, listening to students read aloud, etc? Explain.

ET18. How are you helping the students who are relatively weak at reading to improve?

E- Key Informant Interview (Administrator)

Interviewer Name:

Date:
Time Start: **Time End:**

Administrator Name:
School Name:
Administrator Phone Number (if not already on file):

(Only answer EA1-EA3 if administrator was not interviewed during the baseline evaluation)
ET19.   Male/Female?
ET20.   What is your position?
ET21.   How many years have you been an administrator?

ET22.   Has the school added any books or reading materials to its collection since our last interview in November 2010? If so, approximately how many newly added books are there? How many newly added books are required books/text books and how many are non-required fiction books?

ET23.   Please describe the process for getting the newly added books/reading materials.

ET24.   Who was responsible for paying for the newly added books? How did the financial process happen, from start to finish?

ET25.   How much total money was spent on all classroom reading materials since November 2010? "Classroom reading materials" includes both required reading and supplementary reading materials, and includes textbooks, pamphlets, newspapers, and other materials.

ET26. How many government issued books were received for the following subjects from the District Office?

Subject	Book Name(s)	Number of Copies	Date Received Month/Year
Integrated Science (JHS and SHS Only)			
English			
Citizenship (Primary Only)			
Social Studies (JHS and SHS Only)			

ET27. How much money was spent retrieving books from the District office?

       a. Amount Spent on Employees (i.e. wages):
       b. Amount spent on transportation (i.e. fuel)
       c. Additional amount spent, (Please specify the reason this money was spent):

ET28. What is the name and phone number of someone we can contact at the District Office?

ET29. What privately published books are sold for the following subjects? Please state the name and price of the books. Fill table below.

Subject	Book Name(s)	Publisher(s)	Price
Integrated Sciences			
English			
Social Studies			

For Librarians Only:

[For E and E+OCE Schools only, Kade and Adeiso]
Please describe how students have been using library e-readers. Are students aware that e-readers are available in the library? How often do students borrow library e-readers?

ET30. How do you suggest that we improve the library e-reader system?

[For NE Schools only, Teacher Mante and Suhum]
ET31. How often do students borrow library books?

F- Focus Group (Teachers)

Date:	Moderator:
Site:	Note-Taker:
School Level:	Time-Starting:
Focus Group Category:	Time Ending:

SIGN IN SHEET

No.	Name	School	School Subject Taught or Administrative Position
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Seating Chart: Make a seating chart indicating the participants and their number or identifier. Use this chart to identify speakers as you take notes.

FT 1.   Why is reading important for students?

FT 2.   Currently, do you have access to all government books for your subjects?

FT 3.   Supplementary reading materials are materials that are recommended for students to read, but are not necessarily on an exam. Do you have supplementary reading materials to give to students?

FT 4.   Does every student in your class have required books to use in class? Does every student in your class have required books to take home? Required books could be in paper or e-book form. (Count show of hands.)

FT 5.   If no, the how do you distribute information from the required books? Do you make photocopies? Do you copy text onto the board? Etc.

FT 6.   How do you use supplementary books in the classroom?

FT 7.   What do you think students need in order to improve reading and literacy?

FT 8.   Do you think students should choose the supplementary books that they want to read? Or should teachers and administrators choose these books for them?

[For E, E+OCE Teachers only, Kade and Adeiso]

FT 9. Do you know what an electronic reader is?

FT 10.   Have you heard of any of these products: Kindle? iPAD?

FT 11.   How do you think e-readers affect the classroom? (In terms of the learning environment, student participation and engagement, etc.)

FT 12.   How has student's difficulty with English impacted e-reader's success in improving
        reading?

FT 13.   What are some challenges that have come up with the e-reader? In the classroom?
        At home?

FT 14.   How have you attempted to address these challenges? What are some possible solutions to
    them?

FT 15.   How do you supervise students in using the e-reader?

FT 16.   How do you incorporate the e-reader into your current lesson plans?

FT 17.   What impacts do you think the e-reader has had on students? In academic life? In
        family life? All around?

FT 18. In light of your experience teaching with the e-reader, what is your overall impression of the e-reader as a learning tool for students?

FT 19. What is your impression of how the devices are incorporated into home life? How many students share the device with their families? How receptive are families?bo

[For NE Teachers only, Teacher Mante and Suhum]
FT 20. What is attitude towards reading among your students?

FT 21. Do students read at home? If so, where do they get the books? Is there a library where they borrow them?

FT 22. Has conducting the iREAD study at your school had any impact on students, especially with regards to their attitude towards reading?

Moderator Observations

Note-Taker Observations

F- Focus Group (Students)

Date:	Moderator:
Site:	Note-Taker:
School Level:	Time-Starting:
Focus Group Category:	Time Ending:

SIGN IN SHEET

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Seating Chart: Make a seating chart indicating the participants and their number or identifier. Use this chart to identify speakers as you take notes.

[For E, E+OCE Students only, Kade and Adeiso]

FT 23. What do you like about the e-reader?

FT 24. What do you NOT like about the e-reader? Is there anything you would change about the e-reader to make it better?

FT 25. Do you ever get bored of your e-reader? Why? How frequently?

FT 26. Do you think that your English has improved with your use of the e-reader? For example, do you speak, write, or read English more confidently? Explain.

FT 27. Do e-readers make your classes more engaging and educational?

FT 28. Which kind of book do you believe helps you more with improving your English skills: textbooks or storybooks? Why?

FT 29.   Have other people ever used your e-reader at home? Who? (ex: parents, brothers, sisters) What do they use the e-reader to do?

FT 30.   Apart from reading, what have you used the e-reader to do? (ex: music, internet)

FT 31.   What are your favorite types (genres) of things to read?
     a. Example genres that the interviewer can give: books about school subjects, comedy, Ghanaian language books, newspapers and magazines, non-fiction books, poetry, religious books, romance books, self-help books, sports books, storybooks

FT 32.   How much were you able to access your favorite genre through the e-reader? Explain.

FT 33.   Did you read more books written by Ghanaians or more books written by non-Ghanaian authors? Would you say that <u>none</u> of the books you read are written by Ghanaians, <u>some</u> of the books you read are written by Ghanaians, <u>about half</u> of the books you read are Ghanaian books, or that <u>most</u> of the books you read are Ghanaian books?

FT 34.   What do you like about books written by Ghanaian authors?

FT 35.   What do you NOT like about books written by Ghanaian authors?

FT 36.   What do you like about books written by international authors?

FT 37.   What do you NOT like about books written by international authors?

FT 38.   If this program continues next year, what do you suggest we do to improve….
     a.   the program?

     b.   the e-reader device?

c. student use of e-readers?

d. teacher use of e-readers?

e. Any rules or regulations pertaining to e-readers?

[For E+OCE Students only, Adeiso]
FT 39.   Do you attend Saturday morning e-reader (OCE) activities? How often? If you don't
attend frequently, why not?

FT 40.   What do you like about Saturday morning e-reader (OCE) activities?

FT 41.   What do you NOT like about Saturday morning e-reader (OCE) activities?

[For NE Students only, Teacher Mante and Suhum]
FT 42.   How do you feel about reading? Do you like it? Do you think it is important? Explain

FT 43.   How often do you read outside of school? For example, how much time did you spend reading last night?

FT 44.   Do your teachers encourage you to read? What do they say to encourage you?

FT 45.   Do your parents encourage you to read at home? Do you read with someone in your family?

FT 46.   How many books do you have at home? Where did you get the books from?

Moderator Observations

Note-Taker Observations

F- Focus Group (E+OCE Students)

Date:	**Moderator:**
Site:	**Note-Taker:**
School Level:	**Time-Starting:**
Focus Group Category:	**Time Ending:**

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Seating Chart: Make a seating chart indicating the participants and their number or identifier. Use this chart to identify speakers as you take notes.

G1. How often do you come to Saturday e-reader activities?

G2. What do you like about Saturday e-reader activities?

G3. What was your favorite Saturday e-reader activity: writing letters, reading contests, etc.?

G4. Did the reading contest encourage you to read more during the week?

G5. What do you NOT like about Saturday e-reader activities?

Moderator Observations

Note-Taker Observations

G - Individual Student Questionnaire

Interviewer (for primary students only): _____

Student Name: _____
School Name: _____

G2. Self-confidence is feeling good about your academic abilities, your intelligence, and yourself in general.

Please rate your level of self-confidence by checking one box.

I have very little self-confidence	I have some self-confidence	I have good self-confidence	I have excellent self-confidence

G3. Please fill out this table.

	Never	Sometimes	Often	Very Often
a) I read for fun outside of school				
b) I read aloud to someone at home				
c) I listen to someone outside of school read aloud to me				
d) I talk with my friends or family about what I am reading				
e) I borrow books from my teachers, school, or library				

G1. How do you feel about reading? Do you like it or dislike it? Why?

G2. About how many books do you have in your home right now? _____

G4. Please check ONE of the empty boxes.

	Textbooks	*Storybooks*
Which kind of book helps you to improve your English reading and writing skills the most?		

G3. Please read the list below, which shows types of books and reading materials. Then tell us what your favorite, second favorite, and third favorite types of books and reading materials are.

    a. Books about school subjects

b. Comedy
c. Ghanaian language books in Twi or other local languages
d. Newspapers and magazines
e. Non-fiction books, or books about facts, real people, and real life stories
f. Poetry
g. Religious books
h. Romance books
i. Self-help books that give advice about how to improve my life
j. Sports books
k. Storybooks, or fiction books

Choosing from the list above:

What is your **favorite** type of book or reading material?_____

What is your **second favorite** type of book or reading material?_____

What is your **third favorite** type of book or reading material?_____

G4. How many books do you read by Ghanaian authors?

Please check box below.

NONE of the books I read are written by Ghanaian authors.	**SOME** of the books I read are written by Ghanaian authors.	**ABOUT HALF** of the books I read are written by Ghanaian authors.	**MOST** of the books I read are written by Ghanaian authors.

G5. Please list all of the course subjects you read under the column titled "Subject Name." Then, please fill the table below.

Subject Name (Please list all of the course subjects you read)	Now that you have the e-reader, do you have your own copy of required books to use in the classroom for this subject? Books may be paper books or e-reader books. Yes=Y, No=N	Now that you have the e-reader, do you share copies of required books in the classroom for this subject? Books may be paper books or e-reader books. Yes=Y, No=N	Now that you have the e-reader, are you able to take classroom books home for this subject? Books may be paper books or e-reader books. Yes=Y, No=N

G6. Since the start of the iREAD project in early December 2010, have you or your family paid for books, photocopies, or reading materials related to your schooling? (Please answer Yes, No, or I don't know). If yes, and if you remember, please list the total amount you or your family paid.

G7. When do you fill out your weekly logs? How do you estimate the time spent reading

G8. Circle either YES or NO.

Have you ever filled in your logs with books that you did not actually read?	YES	NO
Do you feel pressure to fill out your weekly logs?	YES	NO

E-Reader Additional Pages

G9. Please fill out this table.

	Never	Sometimes	Often	Very Often
a) I read books on my e-reader				
b) My friends who do not have an e-reader borrow one from the library				

G10. What do you like about the e-reader?

G11. What do you NOT like about the e-reader? Is there anything you would change about the e-reader to make it better?

G12. Do you share the e-reader? If yes, who do you share it with?

G13. List the classes in which you use the e-reader

1.

2.

3.

4.

5.

E+OCE Additional Questions

G14. Please fill out this table.

	Never	Sometimes	Often	Very Often
a) I attend Saturday e-reader activities at my school				

G15. What do you like about Saturday e-reader activities?

G16. What do you NOT like about Saturday e-reader activities?